

ANNUAL REPORT

OF THE

DEPARTMENT OF THE INTERIOR

FOR THE

FISCAL YEAR ENDED MARCH 31, 1923

PRINTED BY ORDER OF PARLIAMENT



OTTAWA

F. A. ACLAND

PRINTER TO THE KING'S MOST EXCELLENT MAJESTY

1923

*To General His Excellency the Right Honourable Lord Byng of Vimy, G.C.B.,
G.C.M.G., M.V.O., Governor General and Commander in Chief of the
Dominion of Canada.*

MAY IT PLEASE YOUR EXCELLENCY:

The undersigned has the honour to lay before Your Excellency the report of the transactions of the Department of the Interior for the fiscal year ended March 31, 1923.

Respectfully submitted,

CHARLES STEWART,

Minister of the Interior.

OTTAWA, September 1, 1923.



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REPORT

OF THE

DEPARTMENT OF THE INTERIOR

1922-23

HON. CHARLES STEWART,
Minister of the Interior,
Ottawa.

SIR,—I have the honour to submit the 50th Annual Report of the Department of the Interior for the fiscal year ended March 31, 1923.

The total area of the three Prairie Provinces is 485,642,698 acres, of which 454,789,678 acres are land. Of this area 200,492,790 acres have been surveyed.

An approximate area of 854,880 acres was granted as homestead entries during 1922, bringing the total of lands so held to 54,164,100 acres; 25,153,300 acres are set aside for Canadian national parks and Dominion forest reserves, and the School Lands Endowment covers 9,335,400 acres. There were 1,212 soldier grant entries made during the year, aggregating approximately 193,920 acres. These entries showed a decline of 443 in number, but the decrease is natural and expected. The number of letters patent issued in 1922 was 6,973, covering an area of 1,782,959 acres. Of these 3,500 patents for 1,237,718 acres were for lands in the province of Saskatchewan.

During the year, 4,632 acres of school lands at an average price of \$13.26 per acre were disposed of by public auction and private sale to the Soldier Settlement Board, the railway companies and for school sites.

Special features in regard to mineral resources were the rapid development of the rich silver-lead deposits of the Yukon; the activity in drilling for oil and natural gas in Alberta and other parts of the West; and the inauguration of a chemical industry in connection with the extraction of the soluble mineral salts found in sloughs and lakes in the western provinces.

There was a considerable increase in the total amount of timber cut on Dominion lands, this increase being general over the different kinds of timber logged and manufactured. There was an increase in the number of grazing leases and in the area grazed but the number of hay permits decreased slightly.

The most notable event in connection with Canadian national parks in the year was the completion of the Banff-Windermere highway. This is not only the first motor road across the central Rockies but it is also the last link in the six thousand mile system of international highways known as the "Grand Circle Tour." Construction and development work has been continued in all the parks to increase the facilities for travellers. The steady increase of visitors to the parks noted in previous years continues. Owing to the sanctuary afforded, all wild life in the parks is thriving and multiplying. The buffalo herd has increased to 6,780 and is now too large for the park area. In the same way,

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because of the Migratory Birds Convention Act, a marked growth is reported in the numbers of the different species of birds.

The work of preserving and marking in a suitable manner national historical sites goes steadily forward. Of the one hundred, so far adjudged to be of national importance, twenty-seven have been acquired, the control of fourteen more has been secured, and protection and restoration work is being prosecuted as the circumstances demand.

The season of 1922 was very favourable from a forest-protection standpoint in Manitoba and Saskatchewan, but one of the worst experienced in Alberta and in the Railway Belt of British Columbia. Aeroplanes were again used effectively in this work. Progress was made in silviculture, both in removing dead and over-mature timber and in experimental work in tree planting and seeding on the reserves. Interest in the planting of trees for shelter-belts on prairie farms increases, and a development in the year was the setting out of a number of tree-belts to check soil-drifting. The Forest Products Laboratories recorded an increased demand for information concerning utilization, and the work of the Forest Research Division in investigating conditions of timber reproduction and growth was extended.

As a result of surveys conducted for many years several steps have been completed which will greatly assist in the development of irrigation. Eight large districts have now been organized. All the large completed irrigation projects had successful seasons in 1922 and more acreage was irrigated than ever before. The Reclamation Service has now under its supervision over 1,400 projects for the use of water, of which over 700 are irrigation schemes.

The annual analysis of water-power indicates that the total turbine installation in the Dominion is approximately 3,000,000 horse-power, representing an investment of \$620,000,000. Two important installations in Western Canada were on the Winnipeg river and provide increased power for industries in the Greater Winnipeg district. The inclusion of all the provinces in the Hydro-metric Survey of Canada and the work connected with the Water Resources Index-Inventory permits the collection and dissemination of data on a Dominion-wide basis.

The different forms of survey work, topographic, geodetic, and that of the international boundary were prosecuted on the usual lines. Work was done on the detailed topographic map of the western provinces, on land classification surveys, on interprovincial boundaries and on the extension of control lines to the Mackenzie valley. Precise levelling was done in five provinces, good progress was made in the extension of triangulation in Quebec, British Columbia, and the Maritime Provinces, and two geodetic base lines were run in British Columbia. The work done on the International Boundary completes that survey with the exception of certain parts between Quebec and the state of Maine.

During the year the field of operations of the Northwest Territories Branch was expanded to take in the administrative work (excepting mining) in the Yukon and the name changed to the Northwest Territories and Yukon Branch. Following a careful survey an area of 10,500 square miles was set aside as a preserve for the herd of 1,500 wood bison, the only remaining wild herd of bison in America. An inspection trip was made by officers of the department in the Canadian Government ship *Arctic* to the Canadian Arctic Archipelago. Two posts were established and means taken to improve the administration of the district.

The scientific operations of the Dominion Observatory at Ottawa and the Dominion Astrophysical Observatory at Victoria were continued and, in certain respects, extended.

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The number of requests for information received by the Natural Resources Intelligence Service continues to increase. The correspondence came from all the British overseas dominions and from nearly every country in Europe. The demand from Great Britain and the United States was particularly large. In the year arrangements were made whereby geographic map work as well as economic mapping would be done in this branch. The photographic and photostat laboratories were kept exceptionally busy.

The total revenue of the department from all sources for 1922-23 was \$4,255,441.78, as compared with \$5,667,419.79 in 1921-22, \$1,287,251.99 of this decrease being due to reduced sales of lands.

A brief synopsis of the work of the various branches is appended hereto, as well as the detailed statements submitted by the heads of branches.

Your obedient servant,

W. W. CORY,
Deputy Minister.

OTTAWA, August 31, 1923.

LANDS PATENTS

Letters Patent.—The number of letters patent issued during the last fiscal year was 6,973, covering an area of 1,782,959 acres, made up by provinces as follows:—

Province	Patents	Acres
Manitoba.....	1,200	177,208
Saskatchewan.....	3,053	1,237,718
Alberta.....	2,401	336,292
British Columbia.....	285	30,351
Yukon Territory.....	8	352
Northwest Territories.....	26	1,038
	<hr/> 6,973	<hr/> 1,782,959

Homestead Entries.—5,343 homestead entries were granted during the year, aggregating an approximate area of 854,880 acres, being a decrease of 2,006 in the number of homestead entries granted as compared with the previous year.

By provinces the entries were as follows:—Manitoba, 879; Saskatchewan, 2,104; Alberta, 2,207; British Columbia, 153.

There were 1,212 soldier grant entries made during the year, aggregating approximately 193,920 acres, made up by provinces as follows:—

	Number of entries	Acres
Manitoba.....	468	74,880
Saskatchewan.....	370	59,200
Alberta.....	328	52,480
British Columbia.....	46	7,360

Accounts and Revenue.—During the fiscal year \$398,805.11, including \$117,715.31 interest on deferred payments, was received on account of purchased homesteads, pre-emptions, and ordinary sales, being a decrease of \$343,646.61, as compared with the payments received during the previous year.

The sum of \$96,322.30 was received for entry fees, improvements, and sundries, making a total revenue for the fiscal year of \$495,127.41.

Refunds were made amounting to \$29,723.22, as follows:—

Value of improvements collected on cancelled homesteads.....	\$25,151 68
Overpayments on sales; and of moneys paid on account of purchased homesteads and pre-emption sales, entries for which had been cancelled.....	4,571 54
	<hr/> \$29,723 22

SCHOOL LANDS

Owing to the prevailing financial depression, no general auction sales of school lands were held during the fiscal year. The following areas, however, were disposed of by public auction and by private sale to the Soldier Settlement Board, railway companies, and for school sites:—

Province	Area	Value	Average per acre
Manitoba.....	332.07 ac.	\$ 4,274 14	\$12 87
Saskatchewan.....	4,155.46 "	54,600 99	13 14
Alberta.....	145.11 "	2,390 88	16 47

The approximate net area disposed of down to the 31st March, 1923, after making deductions for cancelled sales, etc., was as follows:—

Province	Area	Value	Average per acre
Manitoba.....	661,011.49 ac.	\$ 6,393,317 62	\$ 9 67
Saskatchewan.....	1,435,819.77 "	24,308,374 85	16 93
Alberta.....	910,482 11 "	12,656,504 60	13 90

The revenues collected for the fiscal year (less principal moneys and expenditure) and paid over to the provinces were as follows: Manitoba, \$24,041.72; Saskatchewan, \$413,337.50; Alberta, \$186,352.90.

The amounts of interest paid in the fiscal year on the investments of the several provinces were as follows: Manitoba, \$281,750; Saskatchewan, \$601,350; Alberta, \$323,550.

MINING LANDS

Mining rights, the property of the Crown, are no longer permanently alienated, but are disposed of by terminable leases only, and the revenue derived from this source during the year was \$798,712.89. The rich silver-lead deposits of the Mayo-Keno district of the Yukon Territory are being rapidly developed, notwithstanding the remoteness of the region in which these deposits lie and the difficulties of transportation. During the winter months a large quantity of ore was mined and prepared for shipment to the Pacific smelters with the opening of navigation. Extensive development work has also been conducted during the year, and large additional ore bodies have been blocked out, thus materially increasing public confidence in this mining camp. Development of the mineral deposits of northern Manitoba is also progressing satisfactorily.

The quantity of coal mined during the year in Alberta and Saskatchewan was quite equal to past production, and the revenue derived from this source was \$353,056.65. With this coal the domestic and industrial requirements of the western provinces are being supplied, and an effort is being made to place the coal on the markets of Ontario.

Both in the western provinces and in the Northwest Territories oil in considerable quantity has been obtained and prospecting operations, with a view to further discoveries, are being intensively prosecuted. An area of 1,750,391 acres is now held for this purpose under leases acquired under the regulations, and the revenue derived therefrom during the year was \$306,688.82. The discovery of oil in quantity in the Kevin-Sunburst field of northern Montana, adjoining the International Boundary, has given a very considerable impetus to prospecting in southern Alberta. Natural gas in very large quantity has been discovered throughout Alberta, which is being used for domestic and industrial purposes. As the gas produced in the Turner Valley field of Alberta contains gasoline in commercial quantity, an absorption plant for the recovery

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of this product has been installed and is in active operation, all the gasolene content being extracted before the gas is piped to Calgary for domestic consumption.

Interest is being manifested in the natural accumulations of soluble mineral salts comprising, for the most part, sodium and magnesium sulphate, which occur at or near the surface in certain sloughs and lakes in Saskatchewan and Alberta. Leases have been issued, and an industry has been established in connection with certain of these deposits.

TIMBER AND GRAZING LANDS

The total revenue derived from timber, grazing and hay lands amounted to \$886,064.37.

There were manufactured from licensed timber berths 254,042,349 feet board measure of lumber, in addition to large quantities of other material consisting of 28,816,186 laths, 327,696 railway ties, 1,774,987 lineal feet of mining timber, etc. Under permit there were manufactured 17,784,290 feet board measure of lumber, 3,947,571 laths, 354,615 railway ties, besides other various materials.

During the year 183 new timber berths were granted. The area covered by timber berths under license and permit is 6342.12 square miles.

There were 6,980 grazing leases in force, of which 639 were issued during the year. The grazing leases cover a total area of 6,342,644 acres. Hay permits to the number of 4,362 were taken out.

CANADIAN NATIONAL PARKS

The most notable event in the fiscal year 1922-23 in connection with the Canadian national parks was the completion of the Banff-Windermere highway across the central Rockies. This project was first formulated in 1911. Subsequent conferences between the provinces of British Columbia, Alberta and the Dominion Government resulted in the construction programme which has this year been completed. The highway has been laid out so as to afford the finest views along the route as well as the easiest grades. The road is not only the first motor road across the central Rockies but is also the last link in the great 6,000 mile system of highways known as the "Grand Circle Tour".

Considerable construction and development work has been done on the golf courses in the different parks. In the Rocky Mountains park new sewers were laid at different points and extensive draining, burning, and oiling were done in connection with mosquito control. A new line was made for the sulphur water supply from the upper hot springs to the Brett hospital and the Canadian Pacific Railway hotel. Work was done on the pipe line utilizing power from the lake Minnewanka dam for the benefit of Banff. New trails were completed at Jasper park and new bridges constructed at various points. Work was continued on the Edith Cavell highway and a certain amount of new road opened up, completing ten and one half miles of highway. The usual maintenance work was carried on in connection with the roads, bridges, trails and building in the different parks. In Waterton Lakes park a new road leading into the golf course was built and work was continued on the new entrance road to the town-site at Pass creek and on the road leading up Cameron creek several new trails were built. In Yoho park a new building was erected at Field, to house the fire equipment. New development work was carried on at Nakimu caves in Glacier park and a new trail was constructed to Pearly rock. A section of the mount Revelstoke auto road, abandoned by the contractors, was graded and now a length of fourteen miles is open on this road. In Elk Island park a survey was made of the line for the extension of the park.

The number of visitors to the national parks confirms the steady increase of previous years. From practically every park a greater volume of travel is reported as well as an increasing length of stay. With the opening of the first unit of the Canadian National Railway bungalow hotel at Jasper, Jasper national park may be said to have come for the first time into its own and the marked success of the first season indicates a promising future for this great and beautiful reservation. At Rocky Mountains park the increase in visitors is registered at 8,000, with more than 5,000 bathers at the Cave and Basin than at any previous season.

The fire damage in the parks during the year has been comparatively light, although the weather was dry and dangerous and great fires raged in different parts of the country.

Building plans in the various parks are now carefully examined by the architects connected with the branch with a view to establishing more suitable and effective architecture in the various settlements. New motor camping grounds were laid out at Banff. A new subdivision was laid out at Radium hot springs on the Banff-Windermere road and plans were made for the entrance archway buildings at this point. Plans for a new subdivision at Marble canyon and a comprehensive town plan for Canmore mining village were also made.

Owing to the sanctuary afforded, all wild life in the various parks continues to thrive and multiply. A census of the Buffalo herd taken on March 21, 1923, shows: Buffalo park, 6,780; Elk Island park, 281; Rocky Mountains park, 16; total, 7,077. The census for March 21, 1922, was 6,315. This shows an increase for the year of 762. Two hundred and sixty-four surplus bull buffalo were slaughtered during the year. This had become necessary owing to the limited capacity of Buffalo park to support the increased herd. The antelope in Nemiskam reserve continue to thrive. There are now 130 head, an increase of 30 during the past year.

In view of the opening of the first motor road across the central Rockies a campaign of publicity was organized early in the present year and as a result about 50,000 pamphlets were distributed to motorists and others and a large number of prints and slides were circulated. Illustrated lectures on the work of the parks were given by the official lecturer in the different provinces and lecture notes accompanied by suitable slides were also distributed.

As a result of the enforcement of the Migratory Birds Convention Act a marked increase is reported in the valuable forms of bird life. Many inspections were made during the year and areas recommended for reservation as bird sanctuaries. There were distributed during the year 89,250 pamphlets on bird protection, and members of the staff gave 144 lectures during the year, illustrated by slides and motion pictures.

Of the 700 historic sites to which the attention of the department has been called, about 100 have been judged by the Historic Sites and Monuments Board to be of national importance and of these 27 have been acquired by patent and the virtual control of 14 others secured. Throughout the year 18 sites have been suitably marked for historical memorial purposes, and restoration work has been prosecuted on other established sites.

FORESTRY

Continued business depression has had its effect on Forestry Branch revenues, though the decrease from 1921-22 has been small, amounting only to \$2,405, and the revenue of the branch was still somewhat in advance of that for 1920-21. The number of cattle grazed on the reserves decreased about 10,000 head. On the other hand, the number of grazing permits increased by some 10 per cent, indication thus being given of an appreciable increase in the number

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of individuals who recognize the advantages of the forest reserves for grazing purposes. Timber revenues show a very slight increase.

The season of 1922 was very favourable from a forest-protection standpoint in Manitoba and Saskatchewan. Unfortunately, however, the season was perhaps the worst ever experienced in Alberta and in the Railway Belt of British Columbia. The use of aeroplanes for fire-patrol work in protecting the forests from fire was continued in Alberta and Manitoba, and proved satisfactory.

The timber revenue of the branch was practically stationary, although the different items of that revenue show considerable variation. In Alberta the cut of saw-timber increased about one-eighth. In Saskatchewan the cut of cord-wood was the largest on record, and a keen demand was experienced for railway ties. In addition to the revenue derived, the forests stand to gain by the removal of fire-killed and mature timber to which the cutting was as far as possible confined.

The planting on the forest reserves covered some forty-eight acres. Survey and reconnaissance work on forest reserves was continued.

Increasing use is being made of the reserves for summer-resort purposes. A small fish hatchery has been installed near Paul lake, British Columbia, with a view to improving the fishing on the British Columbia reserves. The herd of elk in the Riding Mountain forest reserve is now the largest in Canada.

The interest in the work of tree planting on the prairie farms shows sustained increase. The total number of trees sent out from the nurseries at Indian Head and Sutherland is now over seventy millions, including those to be sent out this spring. A new and rapidly enlarging feature of this work is the establishment of tree-belts to check soil-drifting.

The Forest Products Laboratories report a constantly increasing number of requests for technical information, and generally the year has seen a larger amount of research work than any previous year.

The Forest Research Division is engaged largely in investigations of the problem of handling cut-over and burned-over areas. Investigations carried on by this division have shown results in improved methods for estimating the contents of stands of white pine, spruce (black, white, and red), and balsam fir.

The Division of Forest Resources and Statistics assisted the Ontario Department of Lands and Forests in its survey of Ontario forests, and is at work on its survey of the wood-using industries of the various provinces.

RECLAMATION

Irrigation.—Since the passing of the North West Irrigation Act in 1894, the Department of the Interior has been carrying on extensive investigations of water supply and surveys of irrigable land. The Dominion Government controls all surface water in the Prairie Provinces, and it is the duty of the department to determine how much water is available, and to dispose of it in the most economical manner.

As a result of surveys conducted for many years and now finished, it has been possible to complete several steps which will greatly assist in the development of irrigation. Among these are an amendment to the Irrigation Act, which empowers the Governor in Council to reserve unappropriated water and to allocate it among applicants as he may deem best in the public interest, and an order issued by the International Joint Commission clearly defining Canada's share of the flow of such international streams as the St. Mary and Milk rivers. To still further conserve the limited water supply, investigations have been carried on for several years past on experimental stations at several points

to determine the amount of water required by various crops in different soils to produce the best results, and demonstrations have been conducted at many places for the purpose of instructing the farmers in economical methods of using water.

The increased demand for irrigation in the last few years has resulted in the enactment of greatly improved provincial irrigation district laws, and eight large districts have now been organized under the Alberta Act. Construction work is complete on three of these, two more projects are under construction, and others appear likely to start active work in 1923.

During the year a large number of applications for water rights for domestic, municipal, industrial, and other purposes, as well as irrigation, has been received, and the Reclamation Service has now under its supervision over 1,400 projects for the use of water, of which over 700 are irrigation schemes. All the large completed irrigation projects had successful seasons in 1922 and more acreage was irrigated than ever before.

The flow of the St. Mary and Milk rivers was measured and apportioned during 1922 by engineers of the Canadian and United States Reclamation Services working in co-operation as in previous years.

Drainage.—During the year there was considerably less work done on the investigation of large projects by the Drainage Division of the Reclamation Service than in previous years. The investigation of the Athabaska drainage project in northern Alberta was completed and plans for the reclamation of a district comprising about 46,000 acres of swamp lands prepared. Further surveys and investigations of the Carrot River Triangle in Saskatchewan and Manitoba were carried on, but another season will be required to complete this work which involves the reclamation of upwards of 1,400 square miles of swamp lands.

Since the organization of the Drainage Division, 34 large drainage projects have been investigated, of which 13 aggregating 269,000 acres have been recommended as suitable for governmental reclamation.

The drainage of Waterhen lake, near Kinistino, Sask., was undertaken as an experiment in the reclamation of Crown lands. The work was commenced in 1921 and all the main canals and laterals completed in 1922. A large portion of the lake is now ready for cultivation. There still remain to be constructed a number of small laterals and minor structures, which it is expected will be finished during 1923.

Twenty-three applications were received during the year for permission to construct small projects. These were investigated, and where favourable consideration was given, the necessary surveys were made and plans prepared. Fifty-four inspections were made of other private projects under development and favourable progress and successful results of the cultivation of the reclaimed areas reported.

WATER POWER

The annual analysis made by the Dominion Water Power Branch indicates that the total turbine installation in the Dominion is approximately 3,000,000 horse-power. The investment represented by this installation exceeds \$620,000,000 and stamps water-power utilization as one of the great Canadian industries.

The installation during the past year was approximately a quarter of a million horse-power, while a further 200,000 horse-power installed in 1921 was placed in operation during 1922.

The new installation was distributed amongst sixteen power stations ranging from 110,000 horse-power at Chippawa, Ontario, to 84 horse-power at Tupper

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Lake, N.S. With the exception of Alberta, Saskatchewan, and Prince Edward Island, each province was represented in the total.

The installations of most interest to the department are perhaps those carried out on the Winnipeg river by the Manitoba Power Company and the city of Winnipeg, respectively. The Manitoba Power Company, which is constructing a new hydro-electric development at Great Falls installed a 28,000 horse-power unit during 1922 and by the close of the fiscal year had completed a second, making the total 56,000 horse-power.

The city of Winnipeg installed a 6,900 horse-power unit at its Pointe du Bois station, making its total 67,100 horse-power. Both these developments are operating under concessions from, and under the supervision of, this department.

There appears to be every prospect of a steady advance in Canadian water-power industry since projects, either under construction or actively projected at the present time, will provide ultimately an increase of nearly 1,000,000 horse-power; in addition there are many other projects under study.

The Hydrometric Survey of Canada is now operating on a Dominion-wide basis and the uniform and systematic collection of basic water resources data and their dissemination from, and availability through, a central organization is proving of increasing value to the water-power industry. The Water Resources Index-Inventory work continues with satisfactory results and the inventory makes it possible to place Government officials, Dominion or Provincial, engineers, and the general public interested therein in immediate touch with the most recent and authentic information obtainable.

The shortage and advanced price of all varieties of coal during the past winter continues to keep the question of fuel supply for the Dominion constantly to the forefront. While hydro-electricity cannot be expected to entirely solve this question, it can and has greatly ameliorated conditions. This form of energy has practically eliminated fuel from the central station industry so that but little coal is now consumed for light and power, and water power is helping to restrict the use of coal to its most efficient use, namely for heating. Railway coal consumption remains high but there is reason to believe that before long Canadian railroads will begin to electrify divisions where the density of traffic permits. The extent of water-power's contribution to the solution of the fuel problem may be estimated by the fact that present development is equivalent to an annual consumption of 26,700,000 tons of coal and to an outlay of over a quarter of a billion dollars, much of which would be required to pay for imports and would therefore constitute a heavy burden on the wrong side of the trade balance.

SURVEYS

TOPOGRAPHICAL SURVEY OF CANADA

Details of the work of the Topographical Survey of Canada are presented in complete form in the annual report of the branch, which is issued as a separate publication of the department; the following is a brief summary of what was accomplished during the year.

Thirty-six parties, as compared with thirty-seven during the season of 1921-22, were engaged on field work. Of this number, one was employed in Manitoba, seven in Saskatchewan, seven in Alberta, three in the Railway Belt and the Peace River block of British Columbia, twelve partly in one province and partly in another, and six in the Northwest Territories.

Topographical Surveys.—In order to expedite the publication of a detailed topographical map of the western provinces, the number of parties assigned to

surveys for the revision of sheets of the sectional map of Canada was increased to six, two more than were employed on this work during the previous season. Five of these parties were distributed throughout the settled portions of Manitoba, Saskatchewan, and Alberta, while one operated in the Railway Belt of British Columbia. Each was successful in obtaining the required information for revising one sheet, which covers approximately 4,300 square miles. Since the inception of these surveys in 1919, twenty-three sheets, covering a total area of about 100,000 square miles, have been fully revised and twelve of these have been issued.

In the compilation of these maps, the information secured by the survey parties is co-ordinated with that obtainable from all other available sources, and the final maps are thus made as complete and comprehensive as possible.

One party, employing photo-topographical methods, surveyed an area of 650 square miles in the south part of Kootenay park and vicinity. A preliminary edition of the map of Rocky Mountains park was recently issued, and the compilation of a more detailed map of the same area has been completed.

Another party completed a plane-table survey of Cypress Hills forest reserve. This survey was undertaken in 1921 at the request of the Forestry Branch but could not be completed in one season.

Land Classification Surveys.—There is still a large acreage of vacant Crown lands in the western provinces. The maps, plans, and reports which are compiled in this branch from information obtained by survey parties assigned to the work of investigating and examining these lands are intended to assist in the early development of many areas which have hitherto escaped the notice of land-seekers. These maps and supplementary maps showing the location and extent of the main soil types are available for free distribution.

During the past season, one party operated in the district north of Winnipeg, one was employed southeast of Prince Albert, two in the district north and northwest of Edmonton, and one in the Peace River block of British Columbia. These investigations, which covered 4,225,280 acres, together with those of previous years, bring the total area of lands examined to approximately 24,725,000 acres.

As a result of the season's work, five new maps were compiled. In addition, three maps, showing the results of previous surveys, were revised. Five volumes of township plans in colours, covering two hundred and twenty-five townships, were also compiled.

Northern Control and Settlement Surveys.—Surveys designed to assist in the development of the natural resources of Mackenzie River district, Northwest Territories, were continued by six parties. The most urgent part of this work, consisting of the establishment of a line of control along more than 4,000 miles of shoreline, had been carried out in 1921, but the number of parties available was not sufficient to permit of the completion of all the necessary surveys in the limited time between the opening and closing of navigation in that district.

The survey of Mackenzie river had been carried forward from Great Slave lake for a distance of 110 miles below Norman. It was resumed at this point and continued to the delta of the river. The party engaged on this survey remained in the district throughout the winter in order to complete the traverse to and beyond Aklavik during the season of 1923.

Three parties, in addition to conducting some surveys in the vicinity of lake Athabaska, co-operated on the completion of the traverse of Great Slave lake and its numerous islands. The total length of shoreline traversed by all four parties was approximately 5,000 miles.

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The maps prepared to show the 1921 surveys were issued in time for the opening of navigation in the spring of 1922 and have proved very useful to the navigation companies.

In order to provide more accurate control for these surveys and to extend the Dominion lands system of survey into the Northwest Territories, the Sixth meridian was produced northerly from its previous termination at the north boundary of Alberta to connect with the traverse of Mackenzie river at Providence. One party was required for this work and another on additional surveys of settlements at several important points along Slave and Mackenzie rivers and Great Slave lake.

At the request of the Geological Survey, Department of Mines, a stadia control traverse was carried along the shores of the lakes and connecting streams from Amisk lake to Reindeer lake, in northern Saskatchewan. The purpose of the survey, which extended over a distance of nearly 1,000 miles, is to provide an accurate basis for topographical mapping and the extension of geological investigations throughout this district.

Interprovincial Boundary Surveys.—The survey of the boundary between Ontario and Manitoba was continued due north from the point reached in 1921 to the angle where the boundary turns northeasterly towards Hudson bay. Special survey monuments were erected along this line, showing on brass plates on the two opposite faces the names of the adjoining provinces. The boundary is now established well north of the known mining area, and it is not intended to continue the survey farther at the present time as no important administrative functions are likely to be affected in the near future by the fact that there is still a long portion of this boundary not yet surveyed.

The delimitation of the boundary between Alberta and British Columbia was continued. One party, employing photo-topographical methods, surveyed a portion of the watershed northerly from Yellowhead pass, while another party was engaged on the production of the 120th meridian southerly from Wapiti river to the Rocky mountains.

Levels.—Four parties were employed exclusively on the extension of the level system. Levels were run also in connection with the production of the Sixth meridian and the survey of interprovincial boundaries. In all, 1,585 miles of line were levelled, bringing the total to date for all classes of levelling to approximately 36,000 miles.

Stadia and Miscellaneous Surveys.—Four parties were organized for the stadia survey of water areas. As these parties are equally well adapted for conducting miscellaneous surveys, three of them carried out instructions for urgent work of this nature in the respective districts to which they were assigned. The subdivision of small areas, resurveys, retracements, and alterations and additions to settlements and townsites, at widely separated points throughout the West, necessitated the employment of four travelling parties, each composed of a surveyor and an assistant or engineering helper.

Distribution of Maps, Plans and Surveys Information.—In addition to the particular maps already mentioned there was a steady demand for all maps, plans, and publications of the branch, 26,765 copies of township plans and 30,916 copies of various maps being distributed.

The Admiralty, Ordnance, and Railway Lands Branch of the department was also furnished with a new computation of the areas of railway land subsidies, and numerous inquiries from other branches as to surveys, monuments, areas, land classification, etc., were dealt with.

GEODETIC SURVEY OF CANADA

A report in detail of the operations of the Geodetic Survey of Canada is issued as a separate publication of the department; the following is a brief synopsis of what has been accomplished during the fiscal year 1922-23.

As in the past the activities of the Survey have been mainly for the purpose of providing vertical and horizontal control for the more detailed survey work of other engineering and surveying organizations. The work is dealt with under the following heads: precise levelling, triangulation, base line measurements, and geodetic astronomy.

Precise Levelling.—This work was carried on by five parties during the summer months in the provinces of Nova Scotia, New Brunswick, Ontario, Saskatchewan, Alberta, and British Columbia. At the request of the civic authorities of Hamilton, Ont., and Quebec, Que., a special series of bench-marks of high precision was established in these two cities, the work being carried out under a co-operative plan whereby the Geodetic Survey furnishes the engineer-in-charge and provides the necessary instruments, while the city benefited bears all other expenses. The regular operations in the six provinces mentioned above consisted in the extension of the trunk lines and certain branch lines of precise levelling into districts at present not served with such control. During the winter of 1922-23 precise levels were run on the ice of the Winnipeg river from its source at Kenora, Ont., to its mouth at Fort Alexander, Man., and up the English river to a point somewhat beyond Lac Seul (some 450 miles in all); this being primarily for the benefit of the Dominion Water Power Branch and the Lake of the Woods Control Board.

Triangulation.—Good progress was made in the extension of primary and secondary triangulation. Quebec, British Columbia, and the Maritime Provinces were the scenes of the most extensive operations. Two noteworthy features in the eastern triangulation were the completion of the connection between the Magdalen islands and the mainland and the discovery of the feasibility of a connection to Cape Ray, Newfoundland. These features are of special interest in connection with hydrographic surveys and chart revision. Secondary triangulation on Vancouver island and along the British Columbia-Alberta boundary from the Yellowhead pass northerly were carried out during the season, also the main primary scheme along the coast was materially advanced. When it is completed there will be an arc of combined United States and Canadian triangulation extending along the coast from the southern United States to Skagway, Alaska. Substantial progress was made in the joint triangulation along the International Boundary between Western Canada and the United States. The section of this triangulation assigned as Canada's share extends along the southern boundaries of Manitoba and Saskatchewan, and here four parties operated, one each on reconnaissance, tower building, station preparation, and direction measurement. On the latter party a saving of some twenty dollars per day was effected through an innovation by which the electric signal lamps, instead of being manually operated, were turned on and off at the required hours by means of automatic time-switches. In Ontario a reconnaissance was started on the upper Ottawa river which will have important developments in the future, and at the request of the Public Works Department a secondary triangulation scheme embracing Port Arthur and Fort William harbours was laid down and completed.

Base Lines.—Two geodetic base lines were measured during the fiscal year, one on Vancouver island and one at the Yellowhead pass. In place of being measured on land the latter line was measured in midwinter on the frozen surface of Yellowhead lake. This procedure was a departure from the usual

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practice and was suggested by the rugged character of the country. By utilizing a lake surface as was done in this instance a better opportunity is afforded to secure a location which will fit in with the triangulation scheme and the expense of clearing out the oft-times heavy timber is entirely obviated. Provided the proper precautions are taken to ensure the high standard of accuracy demanded it is felt that this method of measuring geodetic bases has great possibilities for the future and will in many cases enable a base line to be inserted in districts where it would otherwise be impossible.

Geodetic Astronomy.—Two Laplace stations (combined triangulation, longitude, and azimuth) were occupied, one near the city of Vancouver and the other on the coast of Vancouver island. These gave needed control to the British Columbia triangulation.

INTERNATIONAL BOUNDARY

All the surveying operations in connection with the demarcation of the International Boundary between Canada and the United States from the Arctic ocean to the Pacific coast and across the continent to the Atlantic have been completed, with the exception of the definition of the short courses of the boundary along the southwest branch of the St. John river, between Quebec and the state of Maine, and the execution of some topography on Campobello and Deer islands in Passamaquoddy bay and on the point of the mainland near St. Andrews.

In 1921 the engineers of the commission made a joint inspection of the boundary line along the 49th parallel through British Columbia from the gulf of Georgia to the summit of the Rocky mountains. They found that on many stretches of the boundary and particularly across the delta of the Fraser river, the vistas which had been opened seventeen years ago, had so grown over that there was no indication of the boundary line, and the Customs and Immigration officers strongly urged that the vistas should be re-opened particularly in the vicinity of the customs houses.

In co-operation with the United States section of the commission a joint party cleared out the vista across point Roberts and from the east shore of Boundary bay across the Fraser delta to the Columbia valley at the foot of the Coast range—a distance of forty miles.

A number of monuments, which had been disturbed by road-makers, were reset and an additional monument erected at the crossing of the international highway east of Blaine. The line across the valleys of the Similkameen, Kettle and Kootenay rivers, and across the Tobacco plains was also re-opened.

Inspection proved that the high water of recent years in the Lake of the Woods had washed out the reference marks planted in 1914 near the mouth of the Rainy river. These were relocated and repaired.

The topography of the islands and mainland near St. Andrews, N.B., was completed and the referencing of the boundary from St. Stephens, N.B., to the island at Milltown was accomplished in co-operation with the United States section of the commission.

An inspection made last season showed that on the Quebec-Maine boundary the monuments placed in 1912 had greatly deteriorated. It will be necessary to reset the bases of at least seventy monuments between Eastcourt and the head of St. John river.

During the year forty-two map sheets were engraved, printed and signed.

NORTHWEST TERRITORIES AND YUKON

Owing to the similarity of administrative problems, particularly in the matter of resources and wild life, in the Northwest Territories and the Yukon,

the administration of the North West Game Act and the natural resources in the Yukon, with the exception of mining, has been transferred to this branch which is now known as the North West Territories and Yukon Branch.

The portable saw-mill taken over from the Department of Indian Affairs was successfully operated near Fort Smith, N.W.T., cutting 500,000 feet of lumber. It was found necessary for the department to manufacture this lumber in order that the residents might be supplied and thus assist in fostering and encouraging mining and other industries in that remote territory.

A reserve of 10,500 square miles was created as a Wood Buffalo park, and includes the northern and southern ranges of the only herd of wild bison on the continent. Regulations for the preservation of the bison, caribou, and fur bearers are being enforced by a capable warden service under the District Agent at Fort Smith, N.W.T.

Hospitals were supplied with furniture and equipment transferred from the Department of Soldiers' Civil Re-establishment. The grants for treatment and maintenance of patients, both white and half-breed, have been substantially increased.

Prospecting and drilling for oil still continues in the Mackenzie district. Although several holes have been sunk, no new wells have been brought in.

The C.G.S. *Arctic* sailed north, establishing police posts, customs houses and post offices, on islands in the Arctic archipelago. Scientific data were secured in connection with survey work both on land and from the air.

A general survey of the reindeer experiment was made. While the herd at Lobster bay was found to be healthy, the increase has been below normal, and the costs of maintenance excessive. The offer made some years ago by the Anticosti Island authorities, to carry on the experiment, on a basis which will avoid further expense by the Department, has been accepted and the herd will be moved in August, 1923.

Special investigations were made in the Yukon, not only respecting this department, but on behalf of the Departments of Justice, Post Office, and Public Works. The settlements along the Mackenzie river from Fort Smith to Aklavik were inspected. The water frontage at Fort Smith was made more accessible by additional roadways. The area in the neighbourhood of the Wood Buffalo park was investigated and provision made for the protection of the habitat of these wild animals.

DOMINION OBSERVATORY, OTTAWA

Observations with the meridian circle were obtained on 154 nights. The programme of observations on the list of 3,162 stars has been completed, and preparations are in progress for beginning a programme of fundamental observations which will probably occupy several years. A redetermination of pivot errors has been made during the year; these were last measured in 1910; preliminary computations show a small but measurable change in the form of the pivots.

Field observations for latitude and longitude, in continuation of the previous season's work, were carried out at four stations in the Mackenzie River basin, the most northerly station being within the Arctic circle. The longitudes were determined by wireless telegraphy, time signals from several United States stations being received simultaneously at the field stations and at Ottawa; the longitudes are thus based strictly upon Ottawa, irrespective of the time signals employed.

The time service has been maintained as in previous years. Eleven secondary master clocks are synchronized continuously; these in turn control about 575 clocks and dials of various kinds, including the tower clocks at the Obser-

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vatory and the city post office. Relays beating seconds are maintained in three offices in the city, one clock is synchronized every hour, time signals are sent out by telegraph and telephone and the time is recorded on the various seismographs at the observatory. A new Riefler clock was received and installed during the year; comparisons are made twice daily between the two Riefler sidereal clocks, which affords a very competent check on the rates of both and enables determinations of time to be made with much greater accuracy than heretofore.

A time comparison is made daily with Washington and Paris, by means of the wireless time signals sent out by Annapolis and Lafayette. This is in co-operation with the International Time Commission, in connection with the investigation of unexplained discrepancies in meridian observations. Heretofore it has frequently been impossible, in the height of summer, to receive the signals from Lafayette on account of static disturbances. With a view to ameliorating this condition a new and higher aerial was erected during the past winter, and it is hoped that it will be possible now to receive these signals on practically every day throughout the year. Acknowledgement is due to the Marine Department for the gift to the Observatory of the two masts required for this aerial and for their very kind co-operation and assistance in its erection.

The 15-inch equatorial telescope has been utilized as heretofore for obtaining radial velocities of stars, a total of 1,239 spectrograms having been made with exposures varying from 30 to 70 minutes; 90 direct photographs of star fields were also obtained with the short-focus camera attached to the equatorial. Detailed studies of stars of the Beta Canis Majoris type have been continued; among the stars studied are β Cephei, α Scorpii, δ Aquilæ, τ Cygni, γ Ursæ Minoris, θ Ophiuchi, δ Ceti and others. A remarkable analogy has been found between stars of this type and the Cepheid variables, and these investigations give promise of having an important effect on the accepted ideas of the dimensions of the universe.

The direct photographs mentioned above are intended for collecting data on variable stars. A large number of these have now been secured, most of them incidentally with the radial velocity dimensions. Work has been begun on the comparison of these for deducing the light curves of the many variable stars appearing on them.

Some work was also done in collaboration with the Marine Department on the absorption of haze, clouds, and smoke for radiation of different wave-lengths; this was found desirable in connection with the question of the type of illumination used in lighthouses.

The equatorial has, as usual, been available to the public every clear Saturday evening, with an officer in charge to explain the objects shown.

With the eelostat 1053 solar spectrograms have been secured, each comprising nine strips of spectrum, using various combinations of solar spectra from center, limb, and midway positions, with comparison spectra of electric arc and iodine. Measurements and computations of 640 spectrograms have been completed, comprising investigations of solar rotation, solar distance, solar wave-lengths, blended spectra, errors of measurement, and tests of the new spectrocomparator. A pair of arcs has been constructed for use at pressures below atmospheric pressure, and these will be used with the standard arcs in making simultaneous observations of solar spectra. Additions to the new spectrocomparator are in progress, to allow of reading the micrometer head in the eyepiece without removing the eye from the ocular.

The work of the magnetic survey was carried out in much the same manner as in previous years. Two parties were engaged in field work for approximately

six months. The work was carried on in localities outside the territory heretofore covered by the Observatory. Certain stations of the Meteorological Service and the Carnegie Institution of Washington were occupied from which valuable secular change data will doubtless result. One party occupied a series of stations at intervals approximating 30 miles along the Peace river and Slave river from Fort St. John to Resolution, and along the Athabaska river from McMurray to Chipewyan; the other worked along the Hudson Bay railway from The Pas to within 90 miles of York Factory, and from Cumberland House to Neultin lake by way of Reindeer lake. In all seventy-three stations were occupied, and at each station the three magnetic elements were determined. The office work, which occupied the remainder of the year, was confined exclusively to the reduction of field observations.

The gravity work was continued on the same lines as last year, the stations occupied being the same as those at which observations for latitude and longitude were made. The computations for these observations were carried through and the reductions for topography and isostatic compensation for the nine stations occupied during the last two seasons have been practically completed. A new Eötvös torsion balance was received during the year; this instrument is designed to investigate small variations in the direction and force of gravity over restricted areas for the purpose of determining the distributions of subterranean density.

During the year 175 earthquakes were recorded. Those which were recorded with sufficient clearness to warrant definite readings were reported through the press. All were reported by monthly bulletins to the seismological stations on our mailing list, 230 in number. The seismographs have been kept in continuous operation during the year.

The seismologist visited Saskatoon to set up the seismograph in the University of Saskatchewan and also attended the seismological meetings at the Boston session of the American Association. After the Boston meeting the seismograph installations at Harvard, Georgetown, and Washington were visited and much valuable information gained thereby.

Milne-Shaw seismograph No. 23, the second of the pair ordered some time ago, was received and considerable work has been done in getting research work with it under way.

The Observatory has issued and distributed seven publications during the course of the year, besides a number of articles in astronomical periodicals and papers presented at scientific meetings.

There have been three international astronomical meetings which were attended by the director or members of the staff; the most important of these was the meeting at Rome of the International Astronomical Union, which was attended by the director as delegate for Canada. The Union covered thirty-two committees of the astronomical field and its meetings were spread over ten days; it was very well represented by delegates of the allied countries; the Observatory was represented on every committee that dealt with work on which the Observatory is engaged.

The director also represented the Observatory and Canada at the 700th anniversary of the celebration of the founding of the University of Padua, also the closing sessions of the International Seismological Association at Strasbourg, when its affairs were wound up to be continued, however, under the aegis of the newly formed International Union of Geodesy and Geophysics. Two short addresses were given by the director in London before the Royal Astronomical Society, while later he visited and gathered scientific data at the observatories at Potsdam, Leipzig, Jena, Strasbourg, Bergedorf, Zurich, Florence, Brussels, Cambridge, London, and at the recently opened Norman Lockyer Observatory at Sidmouth.

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The visit to Europe by the director covering the preceding meetings and observatories was most profitable, and at the same time showed that Canada occupies now a prominent position in astronomic work and research.

The director also represented the divisions of seismology and terrestrial magnetism at the meeting of the International Union of Geodesy and Geophysics, which was held at Rome at the same time.

DOMINION ASTROPHYSICAL OBSERVATORY, VICTORIA, BRITISH COLUMBIA

This is the fifth annual report of the work of this institution in which actual observations commenced on May 6, 1918. The details of the work are presented in complete form in the publications of the Observatory of which eight numbers were published during the year, the total number to date being thirty-nine. The last number of Vol. I, No. 30, was not published until November but carried with it the index and title page so that the first volume is now complete.

The observing weather during the past year has again been much poorer than the first two years. In the year April 1, 1922, to March 31, 1923, 1,378 star spectra were photographed, the total number to date being 8,767. The total number of nights on which the dome was opened was 205 as compared with 224 the previous year.

The work of the year has been more varied than in previous years chiefly owing to the completion last year of the first radial velocity programme, and to progress and practical completion of some subsidiary programmes then undertaken.

The largest of these undertakings, the determination of the absolute magnitude and spectroscopic parallax of over 400 stars, whose radial velocity has already been obtained here is making good progress. It has been considerably delayed by the absence for five months of one of the two astronomers engaged in it on the Australian Eclipse Expedition but the curves connecting line intensity with absolute magnitude are becoming better defined, a number of new lines showing the relation have been discovered and several new and interesting deductions have been obtained. Practically all the observations required for this programme have been obtained and the discussion should be completed and published in three or four months. As an auxiliary to this programme the radial velocity of 125 stars, obtained from measures of about 600 spectra, have been determined and the results are now in press. An additional programme of 350 of the brighter A to M-type stars has been prepared and these stars will be observed for absolute magnitude on the nights of poor seeing unsuitable for the fainter stars.

The investigation of the spectra of all the O-type stars within reach has made good progress but some further observations which it is hoped to complete in the autumn are still required. In the progress about 30 spectroscopic binaries have been discovered, about two-thirds of those measured, and some very interesting information about group motions and about the behaviour of the H and K lines of calcium has been obtained. In the course of this work the extraordinary system 6°1309, about four times more massive than any previously known, was discovered and investigated. The interesting character of the results was given world-wide newspaper publicity and directed widespread attention to the observatory. A very interesting variable spectrum was also discovered and is now being investigated.

The orbits of five spectroscopic binaries have been completed and are either published or in press and in several others the observation and measurement is well advanced so that the final orbit can soon be obtained. Owing to the press of other work not many observations on the new general programme of 1,500 stars prepared last year have yet been made but it was deemed preferable to first complete the other work.

Along the purely astrophysical side of the work two important contributions have been made. The first Vol. 1, No. 30, "The Spectra of Three O-Type Stars" referred to last year, was received from the printer last October and was at once distributed. The principal results obtained were the discovery of the enhanced helium components to the Balmer lines, the accurate measurement of their wave-lengths with the resulting important calculation and deduction that the structure and dimensions of the atom are the same on the most distant and hottest stars as on the earth. An extension of Saha's theory of ionization including the abundance of the elements was applied to these stars and their temperatures accurately determined. A proposed improvement in their spectral classification was suggested and other valuable data were contained in the paper, which has created much favourable comment. The preliminary investigation of the intensity distribution in laboratory solar and stellar spectra by the wedge method mentioned last year has been completed and the final results and discussion are nearly ready for the press. This paper and method represent, it is believed, a distinct addition to knowledge along these lines and give improved values of solar and stellar temperatures.

A member of the staff took part in the Canadian Eclipse Expedition to Australia and successful plates were obtained for the investigation of the relativity deflection and also a valuable set of plates for the measurement of the polarization of the coronal light and its law of decrease at increasing distances from the sun. The laborious measurement and discussion of the Einstein plates has been completed here and the synopsis of the final results which are confirmatory of the deflection, has been announced. The measures and computation will shortly be prepared for publication and the discussion of the polarization of the corona undertaken as soon as possible.

The telescope has remained unchanged and has given the same satisfactory performance as heretofore. Two new camera lenses for the spectrograph, a medium focus to give a flat field with three prism dispersion and a short focus giving small dispersion to use with faint stars have been obtained and tested giving fine definition and will be used in the regular work as required. Some slight changes were made in the ultra-violet spectrograph and a number of spectrograms obtained but the pressure of other work has prevented its regular use in the past year. It is hoped shortly to obtain spectra in the ultra-violet of a considerable number of typical early type stars in order to investigate this little known region in stellar spectra.

The privilege of viewing celestial objects through the telescope on Saturday nights is being continued with an average attendance of about 200 in the summer and 20 to 50 in the winter.

The Government has provided the most modern equipment for the work to be done and the staff were specially chosen by the director because of their knowledge and aptitude. Progress has been rapid and there is being built up a solid reputation both for the Observatory and the staff, which is evidenced among other ways by the award to the director of a Fellowship in the Royal Society of London. The director and his staff have done much to foster interest in the work of the Observatory both by papers read at the meetings of scientific societies at home and abroad, and by articles contributed to newspapers and scientific journals.

NATURAL RESOURCES INTELLIGENCE SERVICE

The demand for information regarding Canada's natural resources has been well maintained during the past year despite conditions that have tended to affect the prosperity and to limit the extension of agriculture. Mineral, forest,

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and water-power resources have provided a broad basis for continued commercial growth during the lull in land settlement. A feature of particular interest in connection with the work of this service as a central bureau of resources information has been the activity lately displayed by leading United States banks and other financial institutions in drawing the attention of their clients to Canada's commercial position, to her varied resources, and to the attractions of the Dominion as a field for capital investment. Much of the resources information made available by this and other branches of the public service is given very wide and effective use by such institutions.

Information Service.—During the year the Natural Resources Intelligence Service received over 13,600 requests for resources and geographical information, and issued in response approximately 103,400 maps, 52,000 reports, and 16,600 lists of unoccupied farms for sale. Some 7,800 copies of literature containing land settlement information were forwarded to prospective settlers and over 700 mounted wall maps and other publications furnished to educational institutions. The demand for publications for educational use has been featured by the number of university classes initiating courses in Canadian geography and history. Requests for information from abroad have been received from instructors and librarians of leading universities throughout the United States, the Librarian of Harvard alone requiring 500 publications with which to maintain what is regarded as the most complete library on Canadian matters in the United States.

To financial and other business houses some 8,700 copies of maps, reports, and bulletins were issued for office reference, for clients participating through bond issues in the Dominion's commercial development, for the routing of salesmen and other purposes. Insurance companies, some operating in almost every country in the world, and transportation companies, with offices in the chief cities throughout the United States and Europe, utilized the maps and reports to equip their foreign bureaux with reference libraries. A number of organizations were also furnished with the booklet "Compact Facts" and with the Resources Map of Canada, for enclosure with their foreign correspondence.

Enquiries received during the twelve months period included quite a number from Australia, New Zealand, Italy, India, Norway, Belgium, Holland, Denmark, Switzerland, Morocco, Russia, and France, also the customary large correspondence from the United States and Great Britain. Applicants writing from the British Isles required 8,029 publications, while 11,247 copies were distributed in the United States. To other foreign countries 1,064 were sent.

The material made freely available by this service was utilized to advantage by lecturers in addresses to audiences in Washington, D.C., Spokane, Washington; Atlanta, Georgia; and San Francisco. Through such lectures many thousands of United States citizens were given an opportunity to become more closely familiar with the conditions in Canada from the standpoint of settler, tourist, and capitalist. The majority of lecturers were either former Canadians now residing in the United States or recent visitors to this country; consequently they proved an excellent medium through which existing opportunities might be drawn to the attention of those favourable to migrating, investing in development projects, or spending a vacation in Canada.

Practically all departments of the Dominion and Provincial Governments utilized the publications of the service in their work, a total of 52,800 copies being distributed for their use. Of this number Canadian immigration agents throughout the United States required 3,500 lists of unoccupied farms for sale, while the Superintendent of Emigration for Canada in London, England, was furnished with 4,455 publications. An arrangement was entered into between the

Department of Agriculture, Department of Immigration and Colonization, and this department whereby each Dominion land agency was equipped with a supply of government literature and maps of interest and assistance to the homesteader. The co-operative arrangement called for a distribution of 37,000 bulletins, maps, and reports during the year and a number of agents found it necessary to replenish their stock from time to time. It is apparent that the present-day settler is taking advantage of the opportunity to secure the expert advice on the various phases of agriculture afforded by the Department of Agriculture's bulletins regarding methods of farming, now obtainable from the Dominion lands agent. Forms have also been furnished the agencies as a result of an arrangement made between this service and the Department of Agriculture.

Consolidation of Mapping.—During the year arrangements were carried through whereby, in future, the geographic mapping of the department will be conducted as an integral portion of the work of the Natural Resources Intelligence Service. The economic mapping work which has been pursued over a considerable period, has widened very rapidly in scope with the growing public realization of the adaptability of maps to the study and treatment of various problems. Under the new arrangement the department's facilities for both geographic and economic mapping are closely associated and supervised in such manner as to permit the best use of staff and the maximum degree of co-ordination in mapping work.

As now organized the service is carrying on the chief geographic and economic mapping activities of the Dominion Government. It publishes regularly a standard set of geographic maps, a series of homestead maps showing the land situation in the Prairie Provinces, resources maps of the Dominion and of individual provinces, and numerous others designed to meet special administrative or commercial needs. In addition to those compiled for publication it maintains many detailed reference maps showing the distribution of various natural resources, the areas under development and those potentially attractive in greater or less degree. Each year sees steady advance in the work of assembling the available knowledge of Canada's resources and reducing it to readily accessible form through the use of the detailed reference maps.

Settlement Lands.—Of the natural resources of the Dominion the lands available for farm settlement rank first and, as in former years, a major portion of the service's activities has been directed toward obtaining and issuing adequate information on Canada's settlement areas. Publication of the homestead maps has been continued, these maps forming the standard guide to the land situation in Western Canada. In line with the general policy of co-operation with the provinces in the matter of land settlement, the department has been endeavouring to encourage the location of newly arriving settlers in districts where facilities such as roads, schools and so forth are already established. To this end lists of privately owned lands which are presently unoccupied and unproductive have been compiled with a view to enabling prospective buyers to get into touch with the owners. Many of our new citizens arrive here with sufficient capital to purchase homes and are taking advantage of the favourable opportunities of becoming established in settled districts. These lists have been published and widely distributed, giving the names and addresses of individuals and companies who have lands for sale, together with the location of each area offered, the nature of the soil, surface, improvements if any, and the price and terms of sale or lease. Information as first assembled by the service covered some 22,290,000 acres of privately held unoccupied lands in the Prairie Provinces, practically all situated within 15 miles of railways. For this area of

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22,290,000 acres the distribution of ownership, as nearly as can be determined, is approximately as follows:—

Province	Owned in Province	Owned by C.P.R.	Owned by C.N.R.	Owned by H.B. Co.	Owned elsewhere in Canada	Owned in U. S.	Owned outside Canada and U.S.	Address un- known	Total
	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.
Manitoba...	41.81	8.72	6.96	10.36	9.60	22.14	0.41		100.00
Saskatche- wan	11.76	17.57	8.28	16.65	24.28	20.53	0.50	0.43	100.00
Alberta.	24.60	34.33	0.03	10.99	12.38	16.93	0.74		100.00
% of total	21.07	24.59	4.21	13.29	17.05	18.99	0.62	0.18	100.00

In view of the immense areas of land so held it is self-evident that the primary problem of western settlement to-day centres around the need of bringing into the market and into use the alienated lands that are now idle, lying within reach of railways but interrupting continuous settlement. During the past year further investigations have been made, and the service will shortly be in a position to issue revised lists giving up-to-date information for the use of the settler desiring to get into touch with private owners of unoccupied lands.

The Technical Division of the service, embracing complete photographic laboratories, photostat, blue-printing, mimeographing, and other equipment, as well as a plant for mounting and binding maps for special purposes, was kept exceptionally busy throughout the year. The fact that this division is self-contained and possesses facilities for the most up-to-date processes in reproduction work enables the department and other branches of the Government to obtain the speediest service at costs considerably below commercial charges. The still pictures made per annum alone number around 20,000 and the circulation of the lantern slide library, with lectures accompanying the slides, reaches many countries.

THE LAND SITUATION—Manitoba, Saskatchewan and Alberta corrected to January 1, 1923.

	Manitoba	Sas- katchewan	Alberta	Total for all three provinces
	Acres	Acres	Acres	Acres
Surveyed area—				
Land.....	31,440,301	77,116,773	83,461,816	192,018,890
Water.....	4,260,500	1,911,200	2,302,200	8,473,900
Totals.....	35,700,801	79,027,973	85,764,016	200,492,790
Unsurveyed area—				
Land.....	112,130,397	75,223,547	75,416,844	262,770,788
Water.....	13,341,100	6,836,480	2,201,540	22,379,120
Totals.....	125,471,497	82,060,027	77,618,384	285,149,908
Total area—				
Land.....	143,570,698	152,340,320	158,878,660	454,789,678
Water.....	17,601,600	8,747,680	4,503,740	30,853,020
Grand Totals.....	161,172,298	161,088,000	163,382,400	485,642,698

DETAILED STATEMENT of Surveyed Areas in Manitoba, Saskatchewan and Alberta, January 1, 1923

	Manitoba	Sas- katchewan	Alberta	Total
	Acres	Acres	Acres	Acres
Area under homestead (including military home- steads).....	8,269,400	27,616,100	18,278,600	54,164,100
Area under pre-emption, purchased homesteads, sales, half-breed scrip, bounty grants, special grants, etc.....	5,111,100	7,663,300	3,864,100	16,638,500
Area granted to railway companies.....	3,566,997	15,177,063	13,120,014	31,864,074
Area granted to Hudson's Bay Company.....	1,196,800	3,183,600	2,175,900	6,556,300
Area of School Land Endowment (1-18 of area sur- veyed in sections).....	1,637,700	3,942,000	3,755,700	9,335,400
Areas sold subject to reclamation by drainage.....		267	34,083	34,350
Area sold under irrigation system.....		76,832	981,853	1,058,685
Area under timber berths.....	872,600	740,900	1,445,200	3,058,700
Area under grazing leases.....	131,700	2,898,700	2,850,200	5,880,600
Area of forest reserves and parks.....	2,386,700	5,964,300	16,802,300	25,153,300
Area reserved for forestry purposes (inside surveyed tract).....	746,300	1,430,000	1,677,500	3,853,800
Area of road allowance.....	977,132	1,467,500	1,287,200	3,731,832
Area of parish and river lots.....	505,211	84,010	118,564	707,785
Area of Indian reserves.....	434,301	1,071,136	1,367,707	2,873,144
Area of Indian reserves surrendered.....	87,560	410,365	302,495	800,420
Area of water-covered lands (inside surveyed tract)..	4,260,500	1,911,200	2,302,200	8,473,900
Area undisposed of.....	5,516,800	5,390,700	15,400,400	26,307,900
Total areas within surveyed tract.....	35,700,801	79,027,973	85,764,016	200,492,790

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STATEMENT of Land Sales by Railway Companies having Government Land Grants and by the Hudson's Bay Company

Year	Hudson's Bay Company		Canadian Pacific Railway Company		Manitoba, South-western Colonization Railway Company		Qu'Appelle, Long Lake and Saskatchewan Railroad and Steamboat Company	
	Acres	Amount	Acres	Amount	Acres	Amount	Acres	Amount
		\$		\$		\$		\$
1893			93,184	295,288	14,164	57,559	1,603	
1894	7,526	48,225	43,155	131,628	6,312	280,003	640	
1895	4,431	23,209	55,453	176,950	5,623	22,330	2,391	
1896	9,299	52,410	66,624	220,360	21,254	88,568	286	
1897	10,784	53,277	135,681	431,095	63,800	634,644	2,524	
1898	62,000	310,000	242,135	757,792	106,473	363,982	22,534	
1899	56,877	274,625	261,832	814,857	58,019	199,558	61,030	178,517
1900	70,196	352,631	379,091	1,152,836	133,507	437,449	18,932	53,974
1901	82,308	399,804	339,985	1,046,665	59,749	214,953	22,266	74,810
1902	269,577	1,412,332	1,362,478	4,440,500	206,411	713,365	39,835	147,365
1903	330,046	1,939,804	2,260,722	8,472,250	250,372	699,210	843,900	1,476,900
1904	144,857	879,910	857,474	3,516,864	29,522	113,303		
1905	139,721	865,905	411,451	2,045,800	80,342	296,936		
1906	236,191	1,863,375	1,012,322	6,015,060	83,418	360,889		
*1907	69,158	742,221	851,083	4,817,682	3,051	22,645	1,353	16,789
1908	21,184	267,215	81,060	727,367	31,982	153,007	5,621	68,869
1909	25,449	288,836	29,331	383,390	10,396	84,845	37,662	380,371
1910	104,382	1,297,454	655,585	10,473,425	14,501	126,950	106,000	964,600
1911	267,038	3,747,768	715,095	10,372,661	20,313	284,859	113,533	1,237,204
1912	42,554	808,943	855,280	12,420,488	18,932	117,497	35,213	495,116
1913	53,581	1,128,806	447,158	6,348,352	2,768	48,639	15,395	255,399
1914	26,292	572,837	263,962	4,242,089	7,626	91,948	1,629	21,546
1915	16,400	306,550	151,262	2,496,872	489	5,508	1,292	19,118
1916	79,310	1,273,144	242,215	3,670,421	4,780	58,808	12,246	180,361
1917	254,941	4,234,244	405,764	6,612,040	12,470	165,245	21,533	331,596
1918	386,394	6,914,947	545,285	11,044,883	25,933	321,005	49,723	783,062
1919	285,561	4,978,950	602,555	10,580,669	5,289	67,214	33,838	527,670
1920	276,629	4,724,941	571,571	11,356,146	4,623	56,760	32,095	474,895
1921	178,301	3,037,369	275,636	5,898,994	1,518	20,058	11,432	160,472
1922	33,595	545,611	101,497	1,732,350	1,519	15,497	1,274	22,315
1923	24,976	366,257	83,485	1,248,998	373	5,107	1,122	17,000
Totals	3,569,556	43,711,600	14,399,411	133,944,692	1,285,529	5,476,241	1,496,902	7,887,949

*Nine months to March 31.

STATEMENT of Land Sales by Railway Companies having Government Land Grants, and by the Hudson's Bay Company—*Concluded*

Year	Calgary and Edmon- ton Railway Com- pany		Canadian Northern Railway Company		Great Northwest Central Railway Company		Total		Average per acre
	Acres	Amount	Acres	Amount	Acres	Amount	Acres	Amount	
		\$		\$		\$		\$	
1893....	11,260						120,211	352,847	2 93
1894...	11,035						68,668	207,856	3 02
1895...	46,815						114,713	222,489	1 94
1896....	10,553						108,016	361,338	3 34
1897...	9,436						222,225	719,016	3 23
1898....	15,481						448,623	1,431,774	3 18
1899....	24,738	53,335					462,494	1,520,792	3 28
1900....	46,653	128,256					648,379	2,125,146	3 27
1901....	116,719	352,037					621,027	2,088,269	3 36
1902....	323,494	1,033,396					2,201,795	7,746,958	3 56
1903....	231,800	909,600	183,736	631,503	128,435	522,490	4,229,011	14,651,757	3 46
1904...	129,007	563,507	64,469	313,575	41,858	177,081	1,267,187	5,564,240	4 39
1905...	109,191	512,898	231,707	1,221,469	17,593	103,564	990,005	5,046,572	5 09
1906...	85,784	480,063	204,966	1,014,351	20,003	137,503	1,642,684	9,871,241	6 01
*1907..	59,515	346,064	289,576	1,711,109	4,023	41,470	1,237,759	7,697,930	6 02
1908...	8,606	75,644	196,946	1,746,504	1,294	13,855	346,693	3,052,461	8 80
1909....	6,370	66,508			165	7,935	109,373	2,211,885	11 08
1910....	18,323	182,926	285,428	2,783,010	571	6,863	1,184,790	15,835,228	13 36
1911....	11,820	116,231	277,414	3,336,797	1,438	27,417	1,406,651	19,122,937	13 59
1912....	10,853	154,424	365,926	4,216,578	632	11,373	1,329,390	18,224,419	13 70
1913...	4,155	44,212	182,491	2,009,642	1,601	32,105	707,149	9,867,155	13 95
1914...	19,575	460,129	182,491	2,009,642			501,575	7,398,191	14 75
1915...	23,042	444,018			316	6,956	192,801	3,279,031	17 01
1916..	11,689	172,033			4,646	81,182	354,886	5,435,949	15 32
1917.	33,821	573,875	17,796	298,938	8,829	141,439	755,154	12,357,377	16 35
1918...	53,335	815,628	39,546	732,351	16,021	275,724	1,116,237	20,887,600	18 71
1919...	31,774	479,496	65,110	1,261,963	14,530	252,774	1,038,657	18,148,736	17 47
1920...	26,953	425,656	86,305	1,685,241	27,981	464,586	1,026,157	19,188,225	18 69
1921....	11,681	191,928	69,934	1,455,319	5,128	96,616	553,630	10,860,756	19 61
1922...	3,024	51,603	14,163	263,199	167	2,997	155,239	2,833,572	16 96
1923....	1,013	15,552	11,214	190,112	1,120	21,368	123,303	1,864,364	15 12
Totals..	1,507,515	8,649,019	2,769,218	26,881,303	296,351	2,425,007	25,324,482	228,976,111	9 04

*Nine months to March 31.

ACCOUNTS

STATEMENT of Gross Cash Receipts Received from all Sources, for the Fiscal Year 1922-1923. Compared with Receipts for the Previous Fiscal Year.

Source of Revenue	1922-1923	1921-1922	Increase	Decrease	Net Decrease
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Dominion lands.....	2,430,867 14	2,918,529 59		487,662 45	
School lands.....	1,538,449 98	2,335,726 83		797,276 85	
Ordnance lands.....	6,132 79	8,446 48		2,313 69	
Seed grain and relief.....	254,802 23	372,350 89		117,548 66	
Registrars' fees.....	454 00	524 64		70 64	
Fines and forfeitures.....	3,075 46	2,912 73	162 73		
Casual revenue.....	20,060 18	20,128 63		68 45	
Sales of railway lands—Special account.....	1,600 00	8,800 00		7,200 00	
	4,255,441 78	5,667,419 79	162 73	1,412,140 74	1,411,978 01

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STATEMENT of Cash Receipts on Account of Dominion Lands Revenue for the Fiscal Year ended March 31, 1923, as Compared with the Receipts for the Previous Fiscal Year.

Particulars	1922-1923	1921-1922	Increase	Decrease	Net Decrease
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Homestead fees.....	53,460 00	73,540 00		20,080 00	
Sale fees.....	80 00	170 00		90 00	
Improvements.....	34,828 44	55,168 13		20,339 69	
Pre-emption sales under 1908 Act.....	341,288 86	660,501 11		319,212 25	
Purchased homestead sales...	28,624 97	36,200 35		7,575 38	
Map sales, office fees, etc.....	21,414 16	23,352 07		1,937 91	
Rentals of land.....	14,471 49	10,924 49	3,547 00		
Survey fees.....	31 67		31 67		
D.L.S. Examination fees.....	180 00	170 00	10 00		
Patent and interchange fees..	263 00	470 00		207 00	
Suspense Account.....	5,147 49	10,294 23		5,146 74	
Interim receipt account—					
Yukon.....	197 00	61 00	136 00		
Miscellaneous.....	1,000 78	5,006 18		4,005 40	
Timber dues.....	825,465 05	683,490 99	141,974 06		
Grazing rental.....	153,697 11	144,344 67	9,352 44		
Grazing lands improvements	2,019 50	916 70	1,102 80		
Hay permits.....	21,718 43	24,398 99		2,680 56	
Irrigation fees.....	601 00	436 00	165 00		
Irrigation sales.....	5,005 16	12,969 52		7,964 36	
Sale of trees, etc.—Forestry Br.	3,037 96	2,843 75	194 21		
Fishing permits—Forestry Br.	1,411 00	1,420 00		9 00	
Ice permits.....	75 00		75 00		
Coal lands.....	355,325 65	413,913 67		58,588 02	
Mining fees.....	86,825 52	88,962 73		2,137 21	
Dredging leases.....	604 30	2,538 30		1,934 00	
Hydraulic leases.....	5,436 35	2,569 00	2,867 35		
Potash leases.....	736 55	1,553 75		817 20	
Petroleum leases.....	305,770 00	488,359 75		182,589 75	
Export tax on gold.....	25,819 04	30,774 68		4,955 64	
Free certificates for export of gold	16 50	4 50	12 00		
Stone quarries.....	6,354 31	7,527 23		1,172 92	
Sand, stone and gravel.....	1,673 55	1,363 75	309 80		
Rent of water-power.....	4,008 34	3,429 56	578 78		
Amber leases.....		238 00		238 00	
Quartz rental.....	3,770 00	1,061 90	2,708 10		
Quartz acreage.....	377 25		377 25		
Rocky Mountains park.....	62,975 25	59,208 63	3,766 62		
Jasper park.....	5,708 80	7,973 01		2,264 21	
Waterton Lakes park.....	3,472 83	3,148 12	324 71		
Yoho park.....	1,669 54	1,544 12	125 42		
Antelope park.....	572 80	1,015 20		442 40	
Buffalo park.....	130 00	226 85		96 85	
Elk Island park.....	98 50	80 00	18 50		
Fort Anne park.....	31 00	45 00		14 00	
Glacier park.....	405 32	285 38	119 94		
Moose Mountain buffalo res	55 20	452 60		397 40	
Point Pelee park.....	3 00	21 02		18 02	
Vidal's Point park.....	27 00		27 00		
Kootenay park.....	88 20	8 75	79 45		
Isle-aux-Noix reserve.....		215 00		215 00	
Liquor permits N.W.T.....	231 40	194 00	37 40		
Traders licenses N.W.T.....	1,180 00	1,280 00		100 00	
Trappers licenses N.W.T.....	4,433 00	1,599 00	2,834 00		
Taxidermists licenses.....	67 15	79 00		11 85	
General sales.....	38,982 72	52,178 91		13,196 19	
Refunds ..	2,430,867 14	2,918,529 59	170,774 50	658,136 95	487,062 45
	83,151 71	119,079 58		35,927 87	35,927 87
	2,514,018 85	3,037,609 17	170,774 50	622,509 08	451,734 58

In addition to \$38,982.72 on account of general sales, the Department received \$1,590 from sales of railway lands, which sum, as provided by Orders in Council, has been credited to special accounts in the books of the Finance Department.

STATEMENT Showing Receipts on account of Dominion Lands from July 1, 1872, to March 31, 1923.

Fiscal Year	Homestead Fees	Pre-emption Fees	Improvements	Sales		Map sales, (Office and Registration Fees	Dominion Lands Surveyors' Examination Fees	Rents, Survey Fees, Miscellaneous and Suspense Account	Purchased, Homestead, Inspection, Cancellation and Sundry Fees	Timber Dues
				Cash	Scrap					
	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$
	cts.	cts.	cts.	cts.	cts.	cts.	cts.	cts.	cts.	cts.
1872-73.....	6,960 00			19,170 20						109 25
1873-74.....	7,310 00			19,831 75				125 50		2,710 55
1874-75.....	11,150 00			13,666 90		129 00				2,335 25
1875-76.....	4,680 00			3,478 91	320 00					387 00
1876-77.....	2,250 00			1,085 86	136,955 16	4 00		100 00	40 00	320 00
1877-78.....	14,510 00			2,791 86	120,159 54		180 00		290 00	1,620 00
1878-79.....	17,690 00			4,998 39	210,901 81	81 00	310 00	13 70	410 00	325 00
1879-80.....	41,255 00			45,708 97	81,685 86	245 40	580 00	183 25		25,121 46
1880-81.....	20,450 00			71,170 17	70,828 30	985 40	420 00	37 58	1,780 00	32,028 34
1881-82.....	54,155 00		269 00	1,240,328 27	50,590 84	3,036 45	890 00	58 10		58,753 14
1882-83.....	73,015 00		1,758 00	516,092 21	33,638 40	3,109 50	890 00	501 77		90,066 46
1883-84.....	41,580 00		7,114 91	421,863 36	40,919 67	1,289 55	530 00	45,766 53	1,713 45	147,983 10
1884-85.....	25,615 00		2,596 11	199,275 32	45,875 60	1,621 82	370 00	50,068 57	2,685 00	87,474 99
1885-86.....	26,110 00		2,328 75	76,140 41	214,657 97	1,339 34	360 00	20,070 00	5,025 00	64,820 31
1886-87.....	19,614 00		1,971 55	48,175 76	337,610 19	1,171 39	240 00	41,561 00	7,778 40	65,111 74
1887-88.....	23,691 00		1,918 35	52,238 36	313,522 67	1,660 75	240 00	20,591 41	12,078 53	94,964 55
1888-89.....	39,460 00		4,128 48	57,513 16	318,238 57	1,410 16	220 00	10,389 57	20,402 50	90,290 00
1889-90.....	35,920 00		3,250 54	54,896 85	228,744 47	2,099 07	190 00	3,316 23	21,715 00	81,642 95
1890-91.....	29,161 10		6,302 61	91,664 98	171,425 14	1,854 78	88 00	7,951 05	16,790 00	102,902 71
1891-92.....	46,994 00		6,472 31	96,171 67	97,822 41	2,117 31	135 00	29,898 49	27,961 00	106,461 35
1892-93.....	37,689 74		7,113 50	53,251 71	77,231 18	975 20	82 00	18,509 35	22,015 50	105,865 24
1893-94.....	36,462 26		3,497 76	37,993 71	27,810 96	973 11		13,457 09	11,097 00	81,290 51
1894-95.....	29,661 88		3,567 90	46,373 98	23,269 62	695 99	40 00	6,271 77	6,566 90	74,079 20
1895-96.....	18,278 00		3,163 15	49,335 53	46,929 65	610 78	50 00	21,679 31	6,810 50	61,923 47
1896-97.....	21,179 00		3,737 01	80,178 61	16,929 38	795 05	70 00	11,129 72	8,527 50	68,992 82
1897-98.....	31,780 00		5,649 63	116,594 35	28,918 14	1,987 40	10 00	15,376 53	15,859 88	119,313 78
1898-99.....	58,235 00		4,297 62	103,247 58	21,307 58	1,266 05	20 00	67,450 95	20,850 40	155,360 63
1899-1900.....	72,690 00		4,835 81	40,360 93	88,756 22	1,258 85	190 00	31,151 04	21,688 00	126,345 82
1900-01.....	79,910 00		5,213 22	66,950 21	326,270 03	3,874 11	165 00	70,499 54	12,874 00	209,399 32
1901-02.....	144,425 00		8,481 46	155,537 49	169,767 13	5,792 96	370 00	71,993 30	663 00	207,790 90
1902-03.....	320,409 65		11,829 08	196,750 15	158,452 66	5,911 96	365 00	125,128 66	595 00	470,916 93
1903-04.....	255,772 36		15,119 47	442,588 69	189,705 08	5,519 13	463 50	81,246 46	1,081 00	397,341 33
1904-05.....	304,806 25		21,571 25	154,128 01	19,614 59	4,879 13	906 50	144,854 31	1,271 00	266,951 46
1905-06.....	417,834 25		31,795 19	442,588 69	7,654 57	6,012 34	474 00	141,345 30	1,046 25	292,681 53
1906-07 (9 months).....	215,449 55		39,763 63	503,202 41	11,319 89	5,419 06	420 00	60,450 99	685 00	379,476 32
1907-08.....	301,693 73		71,139 47	656,303 03	92,311 24	7,727 29	690 00	148,914 00	1,283 50	473,608 94
1908-09.....	389,039 00	141,550 15	70,928 86	951,442 28	20,136 27	7,296 55	1,040 00	75,596 96	9,579 50	269,837 52

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1909-10.....	415,232 00	174,250 00	105,009 07	1,239,037 33	9,973 84	9,135 49	1,500 00	99,967 27	14,028 30	377,856 45
1910-11.....	445,135 00	156,485 00	143,227 13	1,193,756 04	1,437 84	8,730 01	1,310 00	42,111 92	20,142 85	387,054 96
1911-12.....	391,703 12	102,070 00	184,825 92	1,967,182 85	3,256 99	11,239 14	1,400 00	44,280 89	14,745 50	400,668 61
1912-13.....	337,055 00	85,910 00	168,904 42	1,650,191 87	6,157 27	14,483 91	1,040 00	17,866 65	11,380 00	463,738 75
1913-14.....	317,412 00	61,660 00	187,052 46	1,303,587 54	240 00	16,056 07	1,350 00	40,148 65	8,402 00	378,365 33
1914-15.....	238,295 00	28,720 00	114,982 17	696,672 23	80 00	14,290 23	970 60	33,234 14	4,776 10	310,934 29
1915-16.....	170,350 00	22,760 00	112,782 70	1,090,842 36	.....	11,485 83	470 00	19,495 98	3,475 00	378,960 68
1916-17.....	112,110 20	14,690 00	112,711 33	2,707,203 99	.....	13,976 95	560 00	21,212 91	2,910 00	429,403 09
1917-18.....	83,180 00	7,870 00	89,371 59	3,046,091 55	332 61	12,066 22	250 00	26,513 84	2,200 00	482,006 25
1918-19.....	42,190 00	.....	49,225 97	2,192,860 81	131 47	11,039 54	100 00	77,291 91	360 00	408,728 28
1919-20.....	67,460 00	.....	78,913 74	2,799,605 09	323 41	17,134 19	255 00	28,535 19	340 00	589,780 21
1920-21.....	53,880 00	.....	70,492 66	1,721,171 61	80 00	16,333 67	200 00	23,149 23	370 00	705,313 77
1921-22.....	73,510 00	.....	56,094 83	761,849 89	.....	23,352 07	170 00	26,285 90	3,713 00	683,490 99
1922-23.....	53,460 00	.....	36,847 94	414,278 96	900 00	21,414 16	180 00	20,848 43	6,187 40	825,465 05
Totals.....	6,081,314 09	1,002,736 16	1,861,348 05	29,589,094 28	3,823,317 25	284,007 39	20,754 60	1,859,633 94	354,195,96	11,641,376 58

STATEMENT Showing Receipts on account of Dominion Lands from July 1, 1872, to March 31, 1923—Concluded.

Fiscal Year	Grazing Lands		Hay, Coal, Mining Fees, Stone Quarries, Export Tax on Gold, etc.		Canadian National Parks	Colonization Lands		Gross Revenue	Refunds	Net Revenue	
	Cash	Scrip	Cash	Scrip		Cash	Scrip	\$	cts.	\$	cts.	$	cts.
1872-73								26,239 45		26,239 45	
1873-74								29,980 80		29,980 80	
1874-75								27,641 15		27,641 15	
1875-76								8,865 94		8,865 94	
1876-77								140,755 02		140,755 02	
1877-78								139,584 40		139,584 40	
1878-79								234,732 93		234,732 93	
1879-80								206,801 37	4,636 08	202,165 29	
1880-81								206,990 54	5,038 22	201,952 32	
1881-82	2,245 00		40 00				354,036 17	1,805,734 87	10,687 55	1,795,047 32	
1882-83	22,844 43		913 91				248,492 01	1,051,403 60	9,746 05	1,042,657 55	
1883-84	11,370 60		640 90				253,713 40	1,001,776 67	9,220 50	992,556 17	
1884-85	17,089 75		815 63				1,214 22	451,564 65	12,070 85	439,493 80	
1885-86	29,562 51	3,131 08	1,284 83	80 00				457,973 95	63,389 12	394,584 83	
1886-87	14,212 77	39,487 67	1,570 40	80 00				588,532 80	19,543 16	568,989 64	
1887-88	5,922 47	23,023 28	2,273 73					569,986 68	6,277 66	563,709 02	
1888-89	2,207 69	16,802 63	3,946 56					594,088 04	5,226 23	588,861 81	
1889-90	1,305 57	9,021 63	9,242 08					466,018 76	8,209 74	455,809 02	
1890-91	3,079 55	16,193 77	8,628 44	160 00			5 28	463,068 26	7,195 27	455,872 99	
1891-92	3,726 80	17,222 60	5,616 85					459,760 58	15,291 39	444,469 19	
1892-93	6,380 80	11,542 39	6,266 13					394,825 92	18,314 97	376,510 96	
1893-94	5,740 79	7,687 86	6,243 15					250,069 12	4,544 01	245,525 11	
1894-95	5,353 72	8,628 00	5,229 54					202,983 10	4,365 99	198,617 11	
1895-96	7,071 86	6,255 90	5,813 51					227,694 93	8,368 79	219,326 14	
1896-97	4,715 01	2,500 00	8,633 68					198,676 81	6,833 78	191,843 03	
1897-98	4,728 58	510 39	699,383 01					1,009,741 63	4,678 55	1,005,063 08	
1898-99	5,245 88		1,130,705 70					1,584,328 32	32,296 39	1,552,031 93	
1899-1900	8,382 86	4,083 30	1,038,362 92	20 00				1,503,743 05	23,062 28	1,480,680 77	
1900-01	4,726 28	14,671 99	1,102,127 33	20 00				1,874,159 09	18,368 85	1,855,790 24	
1901-02	7,292 46	8,409 27	737,882 43					1,432,679 25	27,165 55	1,405,513 70	
1902-03	13,911 73	15,041 33	607,723 65					1,890,886 83	21,519 84	1,869,366 99	
1903-04	19,790 27	13,921 29	495,583 18					1,681,824 70	36,721 75	1,645,102 95	
1904-05	36,145 32	5,237 36	364,927 59					1,339,382 35	25,786 90	1,313,595 45	
1905-06	51,583 89	80 00	297,302 44					1,709,315 28	33,418 36	1,675,896 92	
1906-07 (9 months)	43,711 91	400 00	214,257 10					1,490,503 31	35,117 48	1,455,385 83	
1907-08	43,211 78	4,048 01	266,415 31					2,094,479 17	115,080 04	1,979,499 13	
1908-09	53,312 79	3,257 84	253,339 17					2,277,678 09	102,463 78	2,175,214 31	
1909-10	67,807 01	5,081 47	459,870 29					3,022,446 13	121,431 15	2,901,014 98	
1910-11	60,702 50	2,356 00	774,569 27					3,306,073 41	198,689 47	3,107,383 94	

REPORT OF THE DEPUTY MINISTER

SESSIONAL PAPER No. 12

1911-12.....	69,519 41	1,520 00	729,126 56	1,587 32	56,497 74	857,461 08	30,460 50	79,529,280 43	2,969,698 86	197,631 35	3,978,036 73	3,780,405 38
1912-13.....	79,412 76		779,695 53		37,448 72			3,655,202 20	246,105 26	246,105 26	3,409,096 94	3,409,096 94
1913 14.....	84,926 15	320 00	865,499 12		48,800 33			3,313,819 65	277,309 33	277,309 33	3,036,510 32	3,036,510 32
1914-15.....	101,710 58	400 00	1,594,905 42		37,895 97			3,177,866 73	317,764 75	317,764 75	2,860,101 98	2,860,101 98
1915-16.....	118,955 02	160 00	476,408 82		37,493 53			2,443,639 92	143,942 57	143,942 57	2,299,697 35	2,299,697 35
1916-17.....	128,341 50		600,934 13		45,851 45			4,190,238 16	134,213 14	134,213 14	4,055,995 02	4,055,995 02
1917-18.....	125,300 69	240 00	630,427 95		52,160 52			4,557,810 08	113,680 44	113,680 44	4,444,129 64	4,444,129 64
1918-19.....	148,179 55		630,975 74		55,006 72			3,616,281 93	76,031 02	76,031 02	3,540,250 91	3,540,250 91
1919 20.....	183,661 96		896,413 40		76,742 07			4,738,920 85	116,249 03	116,249 03	4,622,671 82	4,622,671 82
1920-21.....	183,756 97		1,234,558 49		76,850 09			4,086,076 49	130,750 93	130,750 93	3,955,325 56	3,955,325 56
1921-22.....	144,344 67		1,071,395 56		74,302 68			2,918,529 59	119,079 58	119,079 58	2,799,450 01	2,799,450 01
1922-23.....	153,697 11		823,183 50		75,304 59			2,431,767 14	83,151 71	83,151 71	2,348,615 43	2,348,615 43
Totals.	2,085,219 25	241,235 06	18,843,132 94	1,947,32	952,045 98	857,461 08	30,460 50	79,529,280 43	2,969,698 86			76,559,581 57

*Including Scrip.

STATEMENT Showing Yearly the Gross Revenue (in cash only) Received from all Sources from July 1, 1903, to March 31, 1923.

Fiscal Year	Dominion Lands	School Lands	Seed , Grain	Ordinance Lands	Fines and Forfeitures	Registration Fees	Casual Revenue	Chinese Immigration Revenue	Total
	\$	\$	\$	\$	\$	\$	\$	\$	\$
	cts	cts	cts	cts	cts	cts	cts	cts	cts
1903-04	1,478,106 33	233,769 62	26,122 30	30,494 34	5,911 92	109,233 73	3,402 94		1,887,041 18
1904-05	1,314,485 40	332,914 48	16,471 34	10,346 90	10,018 49	123,082 86	4,258 14		1,811,577 61
1905-06	1,701,580 71	608,960 79	12,577 29	10,893 17	3,301 77	180,310 73	8,496 09		2,526,123 55
1906-07 (9 months)	1,478,749 51	724,353 73	10,850 06	6,663 90	21 00	46,124 20	11,785 81		2,278,548 21
1907-08	1,998,219 92	708,045 83	12,899 84	8,674 95	1,650 00	2,256 65	20,069 03		2,751,816 22
1908-09	2,254,283 98	687,422 74	53,590 86	205,749 96	281 00	1,352 13	26,224 29		3,228,904 96
1909-10	3,007,390 82	1,292,259 95	175,152 72	189,902 48	211 00	1,471 49	42,625 96		4,709,014 42
1910-11	3,302,279 57	1,614,733 93	153,351 14	6,009 34	4,052 22	1,378 19	11,336 06	971,339 00	5,093,140 45
1911-12	3,973,259 74	1,594,533 96	119,634 13	11,566 46	10,510 48	1,066 05	32,824 65	3,549,242 00	6,714,731 47
1912-13	3,647,457 61	1,621,508 11	171,342 87	60,607 80	7,150 35	1,241 25	22,873 55		9,081,423 54
	24,155,813 59	9,418,503 14	751,992 55	540,909 30	43,111 23	467,517 28	183,896 52	4,520,581 00	40,082,324 61
1913-14	3,313,259 65	1,215,822 37	176,736 89	5,805 98	7,888 50	966 50	27,884 47	2,644,593 00	7,392,957 36
1914-15	3,177,386 73	943,717 00	68,263 56	4,416 64	5,828 00	969 85	11,738 10	588,124 00	4,800,443 88
1915-16	2,443,479 92	934,965 37	2,525,528 50	5,997 98	3,075 21	908 15	28,002 62	19,389 00	5,961,346 75
1916-17	4,189,905 55	1,699,370 06	3,652,729 05	5,553 26	2,184 72	796 85	15,618 26	140,487 00	9,706,644 75
1917-18	4,557,438 61	2,836,216 40	2,613,708 67	7,929 75	3,686 00	562 25	9,074 15	336,757 00	10,365,372 83
1918-19	3,615,958 52	5,087,875 81	1,378,275 76	4,819 27	35 00	789 22	12,381 71		10,100,135 29
1919-20	4,738,840 85	3,900,091 75	1,155,354 64	9,840 33	70 00	430 78	22,837 87		9,827,466 22
1920-21	4,086,076 49	4,480,270 67	773,200 67	8,887 88	1,139 75	448 31	811,970 45		10,161,994 22
1921-22	2,918,529 59	2,335,726 83	372,350 89	8,446 48	2,912 73	524 64	20,128 63		5,658,619 79
1922-23	2,430,867 14	1,538,449 98	254,802 23	6,132 79	3,075 46	454 00	20,060 18		4,253,841 78
	35,471,743 05	24,972,506 24	12,970,950 86	67,830 36	29,895 37	6,850 55	979,696 44	3,729,350 00	78,228,822 87
Increase.....	11,315,929 46	15,554,003 10	12,218,958 31				795,799 92		38,146,498 26
Decrease.....				473,078 94	13,215 86	460,666 73		791,231 00	

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STATEMENT of Revenue Collected within Canadian National Parks for the Fiscal Year ended March 31, 1923, as Compared with the Previous Year.

Particulars	Fiscal Year		Increase	Decrease	Net Increase
	1922-23	1921-22			
<i>Rocky Mountains Park</i>	\$ cts	\$ cts	\$ cts	\$ cts.	\$ cts.
Rent.....	10,393 07	9,497 21	895 86		
Sulphur water rates	898 62	910 50		11 88	
Timber dues	454 15	654 55		200 40	
Cold water rates.....	7,649 49	8,204 62		555 13	
Sewer rates.....	2,659 24	2,961 92		302 68	
Transfer fees.....	166 00	208 00		42 00	
Cave and Basin bathing tickets.	11,205 95	10,403 35	802 60		
Livery licenses.....	1,759 00	844 00	915 00		
Pool, billiard and bowling licenses.....	220 00	236 00		16 00	
Boat licenses.....	104 00	102 50	1 50		
Butcher licenses.....	100 00	70 00	30 00		
Grazing rental.....	608 00	755 00		147 00	
Hot Springs bathing tickets.....	5,302 30	5,831 55		529 25	
Telephone rent.....	5,633 78	5,166 53	467 25		
Bake shop licenses.....	30 00		30 00		
Peddlers' licenses.....	124 00	144 00		20 00	
Guides' licenses.....	33 00	60 00		27 00	
Camping permits.....	544 00	360 00	184 00		
Cemetery lots.....	85 00	92 00		7 00	
Tea room licenses.....	260 00	60 00	200 00		
Sand and gravel.....	55 50	48 85	6 65		
Dog licenses.....	619 00	506 00	113 00		
Automobile permits.....	4,749 00	6,431 00		1,682 00	
Scales.....	354 25	32 50	321 75		
Ice.....	13 00	16 25		3 25	
Sale of lime.....	16 00	16 00			
Theatre licenses.....	167 00	35 00	132 00		
Building permits.....	28 00	51 00		23 00	
Garden and dairy licenses.....	15 00	17 00		2 00	
Gum machines.....	10 00	20 00		10 00	
Golf coupons.....	3,471 50	3,471 50			
Miscellaneous	83 17	59 80	23 37		
Barber shop license.....	10 00		10 00		
Rink license.....	2 00		2 00		
Chauffeurs' licenses.....	157 00	27 00	130 00		
Restaurant licenses.....	70 00	1,270 00		1,200 00	
Electricians' licenses.....	13 00	9 00	4 00		
Stone quarries.....		1 00		1 00	
Improvements.....		635 00		635 00	
Motor licenses.....	1,607 00		1,607 00		
Thawing machine.....	130 66		130 66		
Electric light.....	2,467 86		2,467 86		
Rooming-house license.....	21 00		21 00		
Agent's license.....	180 00		180 00		
Tobacco license.....	39 00		39 00		
Dance hall license.....	30 00		30 00		
News stand license.....	16 00		16 00		
Auctioneer's license.....	10 00		10 00		
Second-hand store license.....	25 00		25 00		
Laundry license.....	90 00		90 00		
Office fees.....	4 00		4 00		
Garage license.....	67 00		67 00		
Plumber's license.....	8 00		8 00		
Sulphur water line (Dr. Brett's).....	206 71		206 71		
Palmist's license.....	10 00		10 00		
	62,975 25	59,208 63	9,181 21	5,414 59	3,766 62

STATEMENT of Revenue Collected within Canadian National Parks for the Fiscal Year ended March 31, 1923, as Compared with the Previous Year—Continued

Particulars	Fiscal Year		Increase	Decrease	Net Decrease
	1922-23	1921-22			
<i>Jasper Park</i>	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Rent.....	2,948 10	2,144 79	803 31		
Timber dues.....	177 00	4,342 72		4,165 72	
Building permits.....	112 00	76 00	36 00		
Boat licenses.....	20 00	5 00	15 00		
Hay dues.....	3 00	3 60		0 60	
Peddlers' licenses.....	96 00	46 00	50 00		
Grazing rental.....	528 00	255 00	273 00		
Guides' licenses.....	43 50	47 50		4 00	
Drivers' and livery licenses.....	467 00	166 00	301 00		
Camping permits.....	78 00	92 00		14 00	
Pool, billiard and bowling licenses.....	120 00	170 00		50 00	
Dog licenses.....	243 00	189 00	54 00		
Restaurant licenses.....	50 00	90 00		40 00	
Butcher licenses.....	50 00	30 00	20 00		
Telephone rent.....	50 00	30 00	20 00		
Cold water rates.....	79 00	48 00	31 00		
Miscellaneous.....	64 90	83 95		19 05	
Theatre licenses.....	22 00	22 00			
Transfer fees.....	5 00	31 00		26 00	
Sand and gravel.....	3 75	6 00		2 25	
Cemetery lots.....	36 00	18 00	18 00		
Chauffeurs' licenses.....	21 00	10 00	11 00		
Garden and dairy licenses.....	4 00	4 00			
Auto permits.....		45 00		45 00	
Cat taxes.....	16 00	12 00	4 00		
Ice.....	7 00	5 00	2 00		
Impounding fees.....	6 55	0 45	6 10		
Motor licenses.....	190 00		190 00		
Rooming-house license.....	5 00		5 00		
Tobacco license.....	8 00		8 00		
Laundry license.....	20 00		20 00		
Advertisement permit.....	10 00		10 00		
Barber's license.....	2 00		2 00		
Agent's license.....	135 00		135 00		
Garage license.....	11 00		11 00		
Electricians' licenses.....	2 00		2 00		
Slot machines.....	40 00		40 00		
Plumber's license.....	1 00		1 00		
Hydroplane license.....	1 00		1 00		
Bake shop license.....	10 00		10 00		
Wood yard license.....	3 00		3 00		
Tea room license.....	20 00		20 00		Decrease
	5,708 80	7,973 01	2,102 41	4,366 62	2,264 21
<i>Glacier Park</i>					Net increase
Rent.....	45 89	53 88		7 99	
Camping permits.....		9 00		9 00	
Grazing rental.....	25 00	30 00		5 00	
Timber dues.....	77 00	4 50	72 50		
Dog licenses.....	36 00	30 00	6 00		
Restaurant licenses.....		20 00		20 00	
Guides' licenses.....	5 00		5 00		
Drivers' and livery licenses.....	104 00	98 00	6 00		
Auto licenses.....	83 43	40 00	43 43		
Building permits.....	2 00		2 00		
Peddlers' licenses.....	10 00		10 00		
Tea room license.....	10 00		10 00		
Tobacco license.....	2 00		2 00		
Barber shop license.....	1 00		1 00		
Hotel licenses.....	1 00		1 00		
Chauffeur's license.....	3 00		3 00		
	405 32	285 38	161 93	41 99	19 94

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STATEMENT of Revenue Collected within Canadian National Parks for the Fiscal Year ended March 31, 1923, as Compared with the Previous Year—Continued

Particulars	Fiscal Year		Increase	Decrease	Net Increase
	1922-23	1921-22			
<i>Waterton Lakes Park</i>	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Rent.....	781 88	801 82		19 94	
Camping permits.....	265 00	253 00	12 00		
Timber dues.....	131 75	129 05	2 70		
Fines.....		37 00		37 00	
Guide's license.....	3 00		3 00		
Grazing rental.....	1,970 00	1,763 00	207 00		
Hay dues.....	3 70	2 50	1 20		
Drivers' and livery license.....	20 00		20 00		
Boat licenses.....	62 50	74 00		11 50	
Transfer fees.....	11 00		11 00		
Building permits.....	27 00	7 00	20 00		
Tea room licenses.....	10 00		10 00		
Theatre licenses.....		10 00		10 00	
Dog licenses.....	9 00	3 00	6 00		
Restaurant licenses.....	31 00	30 00	10 00		
Impounding fees.....	5 00	33 75		28 75	
Peddlers' licenses.....	1 00	4 00		3 00	
Miscellaneous.....	1 00		1 00		
Chauffeur's license.....	7 00		7 00		
Tobacco license.....	5 00		5 00		
Motor license.....	10 00		10 00		
Garden and dairy licenses.....	1 00		1 00		
Garage license.....	11 00		11 00		
Barber shop license.....	1 00		1 00		
Golf fees.....	79 00		79 00		
Sand and gravel permits.....	1 75		1 75		
Hotel and rooming-house license.....	12 00		12 00		
Orchestra license.....	10 00		10 00		
Ice permits.....	2 25		2 25		
	3,472 83	3,148 12	434 90	110 19	324 71
<i>Yoho Park</i>					
Timber dues.....	321 14	319 92	1 22		
Rent.....	485 69	530 20		44 51	
Transfer fees.....	18 00	20 00		2 00	
Camping permits.....	18 00	13 06	5 00		
Cemetery lots.....	3 00		3 00		
Grazing rental.....	46 00	70 00		24 00	
Guides' licenses.....	12 00	25 00		13 00	
Miscellaneous.....		2 00		2 00	
Pool, billiard and bowling licenses.....	40 00	30 00	10 00		
Restaurant licenses.....		50 00		50 00	
Butchers' licenses.....	10 00	10 00			
Dog licenses.....	113 00	116 00		3 00	
Boat licenses.....	32 00	12 00	20 00		
Drivers' and livery licenses.....	197 00	171 00	26 00		
Building permits.....	7 00	4 00	3 00		
Peddlers' licenses.....	10 00	6 00	4 00		
Motor licenses.....	305 71	165 00	140 71		
Rooming-house license.....	5 00		5 00		
Tobacco license.....	5 00		5 00		
Tea room license.....	30 00		30 00		
News stand license.....	2 00		2 00		
Theatre license.....	2 00		2 00		
Chauffeur's license.....	5 00		5 00		
Barber shop license.....	1 00		1 00		
Wood yard license.....	1 00		1 00		
	1,669 54	1,544 12	263 93	138 51	125 42
<i>Kootenay Park</i>					
Timber dues.....	2 00	8 75		6 75	
Rent.....	80 00		80 00		
Building permits.....	1 00		1 00		
Radium Hot Springs.....	5 20		5 20		
	88 20	8 75	86 20	6 75	79 45

STATEMENT of Revenue Collected within Canadian National Parks for the Fiscal Year ended March 31, 1923, as Compared with the Previous Year—*Concluded*

Particulars	Fiscal Year		Increase	Decrease	Net Increase
	1922-23	1921-22			
<i>Elk Island Park</i>	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Camping permits	15 00	11 00	4 00		
Boat licenses	3 00	44 00		41 00	
Building permits		20 00		20 00	
Auto licenses	5 00	5 00			
Timber dues	21 00		21 00		
Hay dues	34 25		34 25		
Ice permits	0 25		0 25		
Rent	20 00		20 00		
	98 50	80 00	79 50	61 00	18 50
					Net Decrease
<i>Buffalo Park</i>	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Timber dues	41 00	96 25		55 25	
Hay dues		32 50		32 50	
Grazing rental	4 00	28 00		24 00	
Auto permits		15 00		15 00	
Miscellaneous	50 00	39 85	10 15		
Motor license	30 00	5 00	25 00		
Ice	5 00	10 25		5 25	
	130 00	226 85	35 15	132 00	96 85
<i>Antelope Park</i>					
Grazing rental	572 80	1,015 20		442 40	
<i>Fort Anne Park</i>					
Hay dues	30 00	45 00		15 00	
Rent	1 00		1 00		
	31 00	45 00	1 00	15 00	14 00
<i>Isle aux Noix Reserve</i>					
Hay dues		215 00		215 00	
<i>Moose Mountain Buffalo Reserve</i>					
Grazing rental	55 20	452 60		397 40	
<i>Point Pelee Park</i>					
Rent	3 00	12 52		9 52	
Miscellaneous		8 50		8 50	
	3 00	21 02		18 02	
<i>Vidal's Point Park</i>	27 00		27 00		Net Increase
<i>Miscellaneous</i>					
Taxidermist's fees, etc.	67 15	79 00		11 85	
Totals	75,304 59	74,302 68	12,373 23	11,371 32	1,001 91

PART I

DOMINION LANDS

REPORT OF THE COMMISSIONER, J. W. GREENWAY

Applications for Patent—	1921-22	1922-23
Number examined.....	72,972	33,235
New applications.....	9,908	5,544
Applications accepted and notifications issued.....	9,607	4,835
Certificates of recommendation sent out.....	2,636	508

REPORT OF THE CHIEF INSPECTOR OF DOMINION LANDS AGENCIES, H. G. CUTTLE

Referring generally to the services rendered to the public by the various land agencies in the West, it is pleasing to report that the same has been most satisfactory. The details of this work are shown in the reports of the Dominion land agencies, and homestead appraisers as submitted by Mr. O. Neff, Inspector of Dominion Lands Agencies in Manitoba and Saskatchewan, and Mr. J. W. Martin, Inspector in Alberta and British Columbia.

REPORT OF THE INSPECTOR OF DOMINION LANDS AGENCIES FOR MANITOBA AND SASKATCHEWAN, O. NEFF

AGENCIES

Agency	Homestead entries granted	Land Sales — Ordinary and school lands	Appli- cations for patent received	Land entries cancelled	Permits Issued	
					Timber	Hay
Battleford.....	387	10	385	1,065	231	556
Dauphin.....	363	21	316	629	392	372
Moose Jaw	76	6	484	566	5	729
Prince Albert.....	1,218	24	546	854	799	412
Winnipeg.....	525	67	634	1,003	.....	.....
Saskatoon	361	17	270	509	72	591
Swift Current.....	61	3	535	694	84	311
The Pas*.....	Mining locat	ions (696)	Assessment	payments (6 2)		
Totals.....	2,991	148	3,170	5,320	1,583	2,971
Compared with 1921-22.....	4,226	186	5,089	4,996	1,529	5,010

*The Pas Office is that of a Mining Recorder who is also Sub-Agent.

HOMESTEAD INSPECTORS, PRINCIPAL WORK PERFORMED BY

Name	Headquarters	Land Inspections made	Appli- cations for Patent	Miles Travelled	
				Wagon	Rail
D. Anderson.....	Battleford.....	281	47	8,784	
N. F. Leach.....	".....	457	40	5,481	2,618
G. L. Speers.....	Dauphin.....	459	130	4,546	7,655
Robt. Hunt.....	".....	326	135	4,846	1,330
W. J. Morrison.....	Prince Albert.....	232	44	2,452	3,004
S. Taylor.....	".....	305	18	7,728	4,513
E. H. E. Webb-Bowen.....	".....	257	70	3,099	3,840
W. W. Whelan.....	".....	277	77	5,745	1,856
C. E. Barr.....	Moose Jaw.....	2	3	34	218
W. Erratt.....	".....	297	4	4,893	807
A. Hamilton.....	".....	628	34	4,469	8,895
E. J. Hober.....	".....	505	19	7,472	2,010
F. G. Arnold.....	".....	33	6	483	968
A. E. Mosses.....	Saskatoon.....	831	51	8,833	640
A. E. Henke.....	".....	392	53	5,350	4,026
A. Smyth.....	".....	825	17	7,753	5,066
J. C. De Balinhard.....	".....	413	41	5,239	7,638
L. Lépine.....	Winnipeg.....	272	36	3,058	6,793
W. Lagimodière.....	".....	345	74	4,168	3,674
H. W. Mabb.....	".....	279	39	3,288	1,768
W. D. Gillespie.....	".....	422	29	5,097	2,205
W. Shields.....	Swift Current.....	457	78	7,266	
J. Furnis.....	".....	666	17	6,331	184
P. McLaren.....	".....	534	46	7,737	1,232
J. A. McDonald.....	".....	674	147	6,902	2,451
Totals.....		10,169	1,255	131,054	73,391
Compared with 1921-22.....		9,703	2,505	154,054	85,994

REPORT OF THE INSPECTOR OF DOMINION LANDS AGENCIES FOR ALBERTA AND BRITISH COLUMBIA, J. W. MARTIN
AGENCIES

Agency	Home- stead entries granted	Soldier grants	Land sales — Ordinary and school lands	Appli- cations for patent received	Land entries cancelled	Permits Issued	
						Timber	Hay
Calgary.....	144	32	13	319	421	620	451
Edmonton.....	1,586	191	63	627	1,470	1,639	1,577
Grande Prairie.....	171	34	8	330	240	244	473
Kamloops.....	59	9	23	84	47	294	55
Lethbridge.....	20	2	4	291	267	493	88
New Westminster.....	50	33	11	22	76		
Peace River ..	285	67	19	214	651	306	497
Revelstoke.....	45	4	2	18	28	111	
Totals.....	2,360	372	143	1,905	3,200	3,707	3,141
1921-22.....	3,134	695	137	3,299	4,052	3,812	2,797

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HOMESTEAD INSPECTORS, PRINCIPAL WORK PERFORMED BY

Name	Headquarters	Land inspections made	Applications for patent taken	Miles Travelled	
				Wagon	Rail
Benzie, J. M.....	Kamloops.....	329	62	6,089	2,404
Cook, H.....	Revelstoke.....	77	12	714	5,038
Cunningham, T. J.....	Edmonton.....	178	21	3,018	2,628
Doze, I. S.....	Edmonton.....	236	36	4,084	1,036
Fleming, G. W.....	Calgary.....	348	69	4,520	3,727
Griffin, A. H.....	Edmonton.....	252	11	3,261	3,634
Horne, J. A.....	Edmonton.....	331	29	5,783	3,240
Hagen, S. C.....	Edmonton.....	540	50	4,690	2,411
Key, A. E.....	Peace River.....	166	9	1,577	3,676
Kembry, R. A.....	Calgary.....	1,223	31	10,198	3,619
Magee, W. D.....	New Westminster.....	81	4	523	640
Mayberry, W. J.....	Lethbridge.....	909	140	10,615	682
McCowan, H. S.....	Edmonton.....	311	11	4,343	1,462
McConnochie, A.....	Edmonton.....	626	24	3,449	7,135
McMullen, J. E.....	Peace River.....	194	14	3,557	1,230
Newton, T. M.....	Grande Prairie.....	161	56	6,518	.....
Smith, L. T.....	Grande Prairie.....	192	67	6,617	180
Tempany, Wm.....	Calgary.....	2,284	3	8,697	1,612
Wilcox, D. E.....	Lethbridge.....	1,312	84	6,622	2,031
Woodlock, P. A.....	Calgary.....	771	31	9,538	1,238
Wynne, A. E.....	Edmonton.....	559	32	6,205	568
Totals.....	.....	11,080	796	110,618	48,191
1921-22.....	.....	7,293	970	127,095	55,665

REVENUES COLLECTED AT DOMINION LANDS AGENCIES, CLASSIFIED UNDER THE VARIOUS HEADINGS

Agency	Agent	Land Patents Branch	Timber and Grazing Branch	Forestry Branch	Reclamation Branch
		\$ cts	\$ cts	\$ cts	\$ cts
<i>Manitoba</i>					
Winnipeg.....	L. P. O. Noel.....	13,550 21	510 15	.....	.....
Dauphin.....	E. Widmeyer.....	5,596 18	7,049 38	12,803 29	.....
<i>Saskatchewan</i>					
Moose Jaw.....	J. A. Reid.....	109,239 99	9,673 55	2,614 30	.....
Prince Albert.....	R. M. Treen.....	17,305 96	220,133 22	29,492 94	.....
Saskatoon.....	L. C. Paterson.....	33,503 89	1,739 70	2,887 40	.....
Swift Current.....	S. Lee.....	118,165 21	21,881 27	10,337 93	435 53
Battleford.....	D. J. Rose.....	21,824 39	5,723 51	3,937 53	.....
<i>Alberta—</i>					
Calgary.....	W. E. Talbot.....	37,088 06	42,147 70	19,132 99	619 48
Edmonton.....	A. Norquay.....	26,003 50	107,636 88	30,301 80	1,487 15
Lethbridge.....	G. A. Nicholson.....	10,728 17	27,753 98	12,483 83	119 85
Peace River.....	R. Cruickshank.....	4,762 68	5,360 43	93 00	.....
Grande Prairie.....	F. L. Christie.....	4,616 87	5,339 60	.....	75 65
<i>British Columbia—</i>					
Revelstoke.....	T. J. Wadman.....	1,718 08	45,082 84	.....	.....
Kamloops.....	J. Bannerman.....	4,992 98	37,418 57	417 60	.....
New Westminster.....	W. C. Cowell.....	2,870 36	.....	.....	.....

REVENUES COLLECTED AT DOMINION LANDS AGENCIES—*Concluded*

Agency	Agent	Mining Lands Branch	School Lands Branch	Miscellane- ous	Total
		\$ cts.	\$ cts	\$ cts.	\$ cts.
<i>Manitoba—</i>					
Winnipeg.....	L. P. O. Noel.....	13,035 56	7,236 31	2,686 06	37,018 29
Dauphin.....	E. Widmeyer.....	5,754 98	2,493 62	552 28	34,249 73
<i>Saskatchewan—</i>					
Moose Jaw.....	J. A. Reid.....	5,310 98	31,151 24	39,691 47	197,681 53
Prince Albert.....	R. M. Treen.....	22 00	5,934 90	3,739 14	276,628 16
Saskatoon.....	L. C. Paterson.....	212 00	15,601 56	24,819 95	78,764 50
Swift Current	S. Lee.....	6,524 78	31,219 01	43,442 05	232,005 78
Battleford.....	D. J. Rose.....	130 00	10,320 46	2,744 40	44,680 29
<i>Alberta—</i>					
Calgary.....	W. E. Talbot.....	120,029 40	42,562 90	7,008 05	268,588 58
Edmonton.....	A. Norquay.....	134,280 25	17,318 71	4,892 54	321,920 83
Lethbridge.....	G. A. Nicholson.....	175,747 61	26,791 07	5,263 38	258,887 89
Peace River.....	R. Cruickshank.....	7,106 71	1,710 13	1,030 56	20,063 51
Grande Prairie.....	F. L. Christie.....	5,084 08	1,474 36	1,375 55	17,966 11
<i>British Columbia—</i>					
Revelstoke.....	T. J. Wadman.....	339 15	.....	.....	47,140 07
Kamloops.....	J. Bannerman.....	299 68	.....	.....	43,128 83
New Westminster	W. C. Cowell.....	31,170 80	.....	.....	34,041 16

REPORT OF THE CONTROLLER OF THE LAND PATENTS BRANCH
AND REGISTRAR OF DOMINION LANDS PATENTS, N. O. COTE

With statements, A to K in relation thereto

LETTERS PATENT

The number of letters patent issued was 6,973, covering an area of 1,782,959 acres, which may be classified as follows:—

Province	Patents	Acres
Manitoba.....	1,200	177,208
Saskatchewan.....	3,053	1,237,718
Alberta.....	2,401	336,292
British Columbia.....	285	30,351
Yukon Territory.....	8	352
Northwest Territories	26	1,038
	6,973	1,782,959

These grants are given in detail in the statements marked A to G, inclusive, and may be summarized as follows:—

Grants	Patents	Acres
Homesteads.....	4,826	746,409
Sales.....	651	71,067
Pre-emptions.....	561	88,320
Purchased homesteads.....	95	13,975
Railways.....	295	795,869
Special or free grants.....	340	40,945
Northwest Half-breeds	7	1,366
Licenses of occupation.....	56	3,371
Soldier grants.....	141	21,490
Hudson's Bay Company.....	1	147
	6,973	1,782,959

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There was a decrease of 6,143 letters patent and a decrease in the area patented of 241,560 acres as compared with the previous year.

There are recorded in the Land Patents Branch 453,304 letters patent, aggregating 101,390,897 acres, which have been issued since May, 1873, to March 31, 1922.

LANDS DISPOSED OF

Five thousand three hundred and forty-three (5,343) homestead entries were granted, aggregating an approximate area of 854,880 acres, made up by provinces as follows: Manitoba, 879; Saskatchewan, 2,104; Alberta, 2,207; British Columbia, 153; total, 5,343.

There was a decrease of 2,006 in the number of homestead entries granted, as compared with the previous year.

By land agencies the 5,343 homestead entries are made up as follows:—

Manitoba—Dauphin, 363; Winnipeg, 516; total, 879.

Saskatchewan—Battleford, 386; Moose Jaw, 77; Prince Albert, 1,219; Saskatoon, 361; Swift Current, 61; total, 2,104.

Alberta—Calgary, 143; Edmonton, 1,586; Grande Prairie, 172; Lethbridge, 20; Peace River, 286; total, 2,207.

British Columbia—Kamloops, 58; New Westminster, 50; Revelstoke, 45; total, 153.

The 5,343 entrants represented 12,768 persons, as compiled from information obtained from each entrant. Of these entries 1,646 were made by residents of the several provinces of the Dominion; 3 by Canadians who had returned from the United States, and 844 by persons who had previously obtained homestead entries, but which entries had been cancelled by default or at the request of the entrants in order, in most cases, to enter for other lands; 778 were made by persons from the British Isles; 1,019 by people from the United States; 420 by naturalized Austro-Hungarians; 126 by Russians and Finns; 113 by Norwegians; 107 by Swedes; 33 by naturalized Germans; 21 by Frenchmen; 24 by Belgians, and the remaining 209 were made by citizens of various other countries.

There were 1,212 soldier grant entries made during the year, aggregating approximately 193,920 acres, made up by provinces as follows:—

	No. of entries	Acres
Manitoba.....	468	74,880
Saskatchewan.....	370	59,200
Alberta.....	328	52,480
British Columbia.....	46	7,360
	<hr/> 1,212	<hr/> 193,920

By land agencies the soldier grant entries were as follows:—

Manitoba—Dauphin, 398; Winnipeg, 70; total 468.

Saskatchewan—Battleford, 45; Moose Jaw, 8; Prince Albert, 255; Saskatoon, 43; Swift Current, 19; total, 370.

Alberta—Calgary, 28; Edmonton, 184; Grande Prairie, 47; Lethbridge, 2; Peace River, 67; total, 328.

British Columbia—Kamloops, 10; New Westminster, 34; Revelstoke, 2; total, 46.

CANCELLED ENTRIES

There were cancelled 8,052 entries, as follows:—

	Manitoba	Saskatche- wan	Alberta	British Columbia
Homesteads.....	1,895	2,278	2,652	236
Pre-emptions.....	6	673	218	....
Purchased homesteads.....	.....	35	8	....
Sales.....	6	18	24	3
	<u>1,907</u>	<u>3,004</u>	<u>2,902</u>	<u>239</u>

SALES

Two hundred and seventy-six (276) sales were made for 8,554 acres of land, with an average for each sale of about 31 acres.

ACCOUNTS AND REVENUE

There are at present kept in this Branch about 19,000 individual accounts in connection with purchased homesteads, pre-emptions, and ordinary sales.

The sum of \$398,805.11, including \$117,715.31 interest on deferred payments, was received on account of purchased homesteads, pre-emptions, and ordinary sales, being a decrease of \$343,646.61 as compared with the payments received during the previous year.

The amount of \$96,322.30 has also been received for entry fees, improvements, and sundries, making a total revenue for the fiscal year of \$495,127.41.

REFUNDS

There were 593 refunds made, amounting to \$29,723.22, as follows:—

447 refunds—Value of improvements collected on cancelled homesteads.....	\$25,151.68
146 refunds—Overpayments on sales; and of moneys paid on account of purchased homesteads and pre-emption sales, entries for which have been cancelled.....	4,571.54
	<u>\$ 29,723.22</u>

NEWLY SURVEYED LANDS THROWN OPEN TO HOMESTEAD ENTRY

Newly surveyed lands comprised in sixty-three townships were made available for homestead entry in the following land agencies:—

Manitoba—Dauphin, in 24 townships; Winnipeg, 10; total, 34.

Saskatchewan—Battleford, in 2 townships; Prince Albert, 4; total, 6.

Alberta—Peace River, in 8 townships; Edmonton, 1; Calgary, 4; Grande Prairie, 4; total, 17.

British Columbia—New Westminster, in 2 townships; Kamloops, 4; total, 6.

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STATEMENT A—Letters patent issued, covering Dominion Lands in Manitoba, Saskatchewan, Alberta, Northwest Territories, British Columbia, and the Yukon Territory.

No	Nature of Grant	From April 1, 1922, to March 31, 1923		From April 1, 1921, to March 31, 1922	
		Patents	Acres	Patents	Acres
1	British Columbia homesteads.....	143	16,214	202	21,922
2	British Columbia sales.....	21	789	15	1,276
3	Coal lands sales.....	1	288		
4	Coal surface sales.....	1	40		
5	Homesteads, Peace River Block.....	73	11,386	87	13,850
6	Homesteads.....	4,609	718,649	9,363	1,464,675
7	Hudson's Bay Co.....	1	147	5	1,036
8	Licenses of occupation.....	56	3,371	10	410
9	Manitoba Act grants.....	1	40		
10	Military bounty grants.....			2	319
11	Military homesteads.....			2	632
12	Mining lands sales.....	13	607	14	653
13	Mineral rights (80 acres).....	1		12	
14	North West half-breed grants.....	7	1,366	4	723
15	Parish sales.....	5	442	6	508
16	Petroleum and Natural Gas, surface sales.....	1	7		
17	Pre-emption sales.....	561	88,320	1,481	234,393
18	Purchased homesteads.....	95	13,975	178	26,140
19	Quit claim, sales.....	8	266	20	869
20	Quit claim, special grants.....	48	7,189	58	7,546
	Railways—				
21	Alberta and Great Waterways Railway Co.	68	1,117	1	7
22	Calgary and Edmonton Railway Co.....	2	317		
23	Canadian Northern Railway Co.....	135	792,005	20	2,191
24	Canadian Northern Pacific Railway Co....	1	2	6	66
25	Canadian Northern Saskatchewan Railway Co.....	2	17	2	14
26	Canadian Northwestern Railway Co.....	22	302	10	90
27	Canadian Pacific Railway grants.....	19	1,608	18	126
28	Canadian Pacific Railway roadbed and sta- tion grounds.....	11	88	11	135
29	Central Canada Railway Co.	4	26	9	133
30	Edmonton, Dunvegan and British Columbia Railway Co.....	2	26	14	170
31	Grand Trunk Pacific Railway Co.....	1	12		
32	Grand Trunk Pacific Branch Lines Co.....	6	68	1	1
33	Kettle Valley Railway Co.....	9	250		
34	Manitoba and Northwestern Railway Co..	1	3		
35	Manitoba and Southwestern Colonization Railway Co.....			2	206
36	Nicola, Kamloops and Similkameen Railway Co.	12	28	2	15
37	Sales ..	260	14,398	348	33,755
38	Sales, Peace River Block.....	1	14	1	61
39	School lands sales.....	332	54,024	827	161,649
40	School lands, special grants ..			1	12
41	Soldier grants.....	141	21,490	63	10,015
42	Special grants.....	291	33,716	301	40,530
43	Yukon Territory homesteads.	1	160	2	320
44	Yukon Territory sales.....	7	192	18	71
	Totals	6,973	1,782,959	13,116	2,024,519

STATEMENT B—Letters patent issued, Dominion Lands in Manitoba

No	Nature of Grant	From April 1, 1922, to March 31, 1923		From April 1, 1921, to March 31, 1922	
		Patents	Acres	Patents	Acres
1	Homesteads.....	970	149,243	2,063	321,308
2	Hudson's Bay Co.....			1	160
3	Manitoba Act grants.....	1	40		
4	Mining lands sales.....	9	407	8	361
5	Parish sales.....	4	397	6	508
6	Pre-emption sales.....	1	160	2	320
7	Quit claim, sales.....			2	107
8	Quit claim, special grants.....	6	590	8	421
	Railways—				
9	Canadian Northern Railway Co.....	5	14	7	45
10	Canadian Pacific Railway roadbed and sta- tion grounds.....	3	5	6	37
11	Manitoba Southwestern Colonization Rail- way Co.....			2	206
12	Sales.....	47	3,288	71	2,344
13	School lands sales.....	55	9,814	129	23,839
14	Soldier grants.....	14	2,187	1	154
15	Special grants.....	85	11,063	89	12,365
	Totals.....	1,200	177,208	2,395	362,175

STATEMENT C—Letters patent issued, Dominion Lands in Saskatchewan

No.	Nature of Grant	From April 1, 1922, to March 31, 1923		From April 1, 1921, to March 31, 1922	
		Patents	Acres	Patents	Acres
1	Homesteads .. .	1,865	292,228	3,638	570,939
2	Hudson's Bay Co.			1	408
3	Licenses of occupation.	9	30	1	1
4	Military homesteads ...			1	320
5	Mining lands sales			5	239
6	Mineral rights			4	
7	North West half-breed grants	6	1,286	2	403
8	Pre-emption sales	456	71,859	952	150,675
9	Purchased homesteads	71	10,741	115	17,762
10	Quit claim, sales.....	5	101	13	495
11	Quit claim, special grants.....	41	6,439	33	4,544
	Railways—				
12	Canadian Northern Railway Co.....	128	791,961	13	2,146
13	Canadian Northern Saskatchewan Railway Co.....	2	17	2	14
14	Canadian Pacific Railway grants.....	1	14	9	102
15	Canadian Pacific Railway roadbed and sta- tion grounds	1	10		
16	Grand Trunk Pacific Branch Lines Co.			1	1
17	Manitoba and Northwestern Railway Co....	1	3		
18	Sales.....	87	3,989	127	6,735
19	School lands sales	188	34,513	511	110,388
20	School lands, special grants.....			1	12
21	Soldier grants.....	72	11,310	37	5,873
22	Special grants.....	120	13,217	85	11,986
	Totals.....	3,053	1,237,718	5,551	883,043

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STATEMENT D—Letters patent issued, Dominion Lands in Alberta

No.	Nature of Grant	From April 1, 1922, to March 31, 1923		From April 1, 1921, to March 31, 1922	
		Patents	Acres	Patents	Acres
1	Coal lands sales.....	1	288		
2	Coal surface sales.....	1	40		
3	Homesteads	1,774	277,178	3,662	572,428
4	Hudson's Bay Co.....	1	147	3	468
5	Licenses of occupation.....	47	3,341	9	409
6	Military bounty grants.....			2	319
7	Military homesteads.....			1	312
8	Mining lands sales			1	53
9	Mineral rights (80 acres).....	1		8	
10	North West half-breed grants	1	80	2	320
11	Parish sales	1	45		
12	Petroleum and Natural Gas, surface sales	1	7		
13	Pre-emption sales	104	16,301	527	83,398
14	Purchased homesteads.....	22	3,203	55	8,252
15	Quit claim, sales	3	165	5	267
16	Quit claim, special grants.....	1	160	17	2,581
17	Railways—				
17	Alberta and Great Waterways Railway Co.....	68	1,117	1	7
18	Calgary and Edmonton Railway Co.....	2	317		
19	Canadian Northern Railway Co.....	2	30		
20	Canadian Northern Western Railway Co.....	22	302	10	90
21	Canadian Pacific Railway grants.....	17	1,580	8	14
22	Central Canada Railway Co.....	4	26	9	133
23	Edmonton, Dunvegan and British Columbia Railway Co.....	2	26	14	170
24	Grand Trunk Pacific Railway Co.....	1	12		
25	Grand Trunk Pacific Branch Lines Co.....	6	68		
26	Sales.....	112	6,739	135	24,378
27	School lands sales.....	89	9,697	187	27,422
28	Soldier grants.....	50	7,644	25	3,988
29	Special grants.....	68	7,779	111	14,840
	Totals.....	2,401	336,292	4,792	739,849

STATEMENT E—Letters patent issued, Dominion Lands in British Columbia

No.	Nature of Grant	From April 1, 1922, to March 31, 1923		From April 1, 1921, to March 31, 1922	
		Patents	Acres	Patents	Acres
1	British Columbia homesteads.....	143	16,214	202	21,922
2	British Columbia sales.....	21	789	15	1,276
3	Homesteads, Peace River Block.....	73	11,386	87	13,850
4	Purchased homesteads.....	2	31	8	126
5	Railways—				
5	Canadian Northern Pacific Railway Co.....	1	2	6	66
6	Canadian Pacific Railway grants.....	1	14	1	10
7	Canadian Pacific Railway roadbed and sta- tion grounds.....	7	73	5	98
8	Kettle Valley Railway Co.....	9	250		
9	Nicola, Kamloops and Similkameen Rail- way Co.....	12	28	2	15
10	Sales, Peace River Block.....	1	14	1	61
11	Soldier grants.....	5	349		
12	Special grants.....	10	1,201	15	1,337
	Totals.....	285	30,351	342	38,761

STATEMENTS F and G—Letters patent issued covering Dominion Lands
F—In the Yukon Territory

No.	Nature of Grant	1922-23		1921-22	
		Patents	Acres	Patents	Acres
1	Yukon Territory homesteads.....	1	160	2	320
2	Yukon Territory sales.....	7	192	18	71
	Totals.....	8	352	20	391

G—In the Northwest Territories

1	Mining lands sales.	4	200		
2	Sales.....	14	382	15	298
3	Special grants.....	8	456	1	2
	Totals	26	1,038	16	300

STATEMENT H—Number of Homestead Entries made in the fiscal year 1922-23,
Nationality of Homesteaders, and Provinces in which entries were made

Nationality	Provinces				Total
	Manitoba	Saskat- chewan	Alberta	British Columbia	
Canadians from Ontario.....	69	272	227	21	589
“ Quebec.....	28	75	92	3	198
“ Nova Scotia.....	12	35	23	1	71
“ New Brunswick.....		13	21	4	38
“ Prince Edward Island.....	3	13	13	2	31
“ Manitoba.....	151	109	36	3	299
“ Saskatchewan.....	11	159	17		187
“ Alberta.....	1	15	174	3	193
“ British Columbia.....		2	20	18	40
Persons who had previous entry.....	123	307	396	18	844
Newfoundlanders.....		5	1		6
Canadians returned from the United States.....		1	2		3
Americans.....	67	434	505	13	1,019
English.....	112	206	230	27	575
Scotch.....	32	40	49	12	133
Irish.....	16	25	27	2	70
French.....	5	10	5	1	21
Belgians.....	6	7	11		24
Swiss.....	2	6	10		18
Italians.....	2	4	3	1	10
Roumanians.....	2	6	1	2	11
Syrians.....	1	2			3
Germans.....	9	7	15	2	33
Austro-Hungarians.....	133	135	144	8	420
Hollanders.....	5	4	7		16
Danes (other than Icelanders).....	1	13	18	1	33
Icelanders.....	5	9	1		15
Swedes.....	16	45	45	1	107
Norwegians.....	12	54	44	3	113
Russians (other than Finns).....	27	39	29	1	96
Finns.....	14	8	5	3	30
Serbians.....		1	1		2
Chinese.....			1		1
New Zealanders.....				2	2
Hindoos.....				1	1
Greeks.....	1	1			2
Poles.....	13	41	24		78
South Americans.....		1	1		2
Australians.....			1		1
Mexicans.....			1		1
South Africans.....			7		7
Totals.....	879	2,104	2,207	153	5,343

Number of souls represented by above entries, 12,768.

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STATEMENT I—Number of Homestead Entries made in the Provinces of Manitoba, Saskatchewan, Alberta, and British Columbia during the fiscal year 1922-23, by persons coming from the United States

State	Provinces					State	Provinces				
	Manitoba	Saskatchewan	Alberta	British Columbia	Total		Manitoba	Saskatchewan	Alberta	British Columbia	Total
Arkansas		2			2	Brought forward.	52	352	317	6	727
California			5		5	Nebraska.....		8	25		33
Carolina, N		3	4		7	New Hampshire.			1		1
Colorado	1	1	1		3	New Jersey.....	1		2		3
Connecticut		1			1	New Mexico.....			1		1
Dakota, N	15	78	30		123	New York.....	1		13	1	21
Dakota, S		26	27		53	Ohio.....	2		8	1	19
Delaware		1	1		2	Oklahoma.....		4	25		29
Idaho	2	3	10		15	Oregon.....	1	3	15	1	20
Illinois	3	20	31		54	Pennsylvania	1	9	14		24
Indiana		8	7		15	Rhode Island....		2	2		4
Iowa	3	30	32	1	66	Tennessee.....		1	7		8
Kansas		9	14		23	Texas.....	1	2	5		8
Kentucky		2			2	Utah.....			1		1
Maine		2	2		4	Vermont.....		2	1		3
Massachusetts		6	6		12	Virginia.....	1		6		7
Michigan	5	23	45	1	74	Virginia, W.....		1	1		2
Minnesota	22	122	64	3	211	Washington.....		8	24		32
Mississippi	1	1	2		4	Wisconsin.....	6	24	37	4	71
Missouri		6	21		27	Wyoming.....	1	4			5
Montana		8	15	1	24						
Carried forward	52	352	317	6	727	Totals.....	67	434	505	13	1,019

STATEMENT J—Number of Homestead Entries made during the fiscal year as compared with the previous fiscal year

Agency	Manitoba		Saskatchewan		Alberta		British Columbia		Total
	1922-23	1921-22	1922-23	1921-22	1922-23	1921-22	1922-23	1921-22	
Battleford.....			386	343					
Calgary.....					143	341			
Dauphin.....	363	611							
Edmonton					1,586	1,664			
Grande Prairie					172	312			
Kamloops							58	11	
Lethbridge.....					20	149			
Moose Jaw.....			77	334					
New Westminster							50	41	
Peace River.....					286	462			
Prince Albert			1,219	1,228					
Revelstoke							45	48	
Saskatoon.....			361	548					
Swift Current			61	280					
Winnipeg.....	516	877							
Fiscal year 1921-22.....									7,349
Fiscal year 1922-23.....									5,343
Net decrease.....									2,006
Totals.....	879	1,488	2,104	2,733	2,207	2,928	153	200	

STATEMENT K—Number of Soldier Grant Entries made during the fiscal year 1922-23 as compared with the previous fiscal year

Agency	Manitoba		Saskatchewan		Alberta		British Columbia		Total
	1922-23	1921-22	1922-23	1921-22	1922-23	1921-22	1922-23	1921-22	
Battleford			4	95					
Calgary.....					28	80			
Dauphin	338	214							
Edmonton					184	302			
Grande Prairie					47	96			
Kamloops							10	18	
Lethbridge					2	27			
Moose Jaw			8	4					
New Westminster							34	43	
Peace River.....					67	109			
Prince Albert			25	298					
Revelstoke							2	7	
Saskatoon.....			43	79					
Swift Current.....			19	76					
Winnipeg	70	169							
Fiscal year 1921-22.....									1,655
Fiscal year 1922-23									1,212
Net decrease									443
Totals.....	408	383	370	599	328	614	4	68	

REPORT OF THE CONTROLLER OF SCHOOL LANDS, W. T. ROLLINS

There being no particular demand for lands in the Prairie Provinces, owing to the financial depression, no general auction sales of school lands were held during the fiscal year. The following areas were however disposed of by public auction and by private sale.

MANITOBA			
How disposed of	Area acres	Value	Average per acre
Public Auction.....	2.02	\$ 973 64	\$ 482 00
Soldier Settlement Board.....	320.00	3,200 00	10 00
Railway companies.....	10.05	100 50	10 00
Total.....	332.07	4,274 14	12 87
SASKATCHEWAN			
Soldier Settlement Board.....	3,844.68	\$52,647 18	\$ 13 69
Railway companies.....	28.09	533 26	18 98
Dried up areas.....	282.69	1,420 55	5 04
Total.....	4,155.46	54,600 99	13 14
ALBERTA			
Public auction.....	4.00	\$ 440 00	\$ 110 00
Railway companies.....	131.11	1,850 88	14 11
School sites	10.00	100 00	10 00
Total.....	145.11	2,390 88	16 47

The following statement shows the approximate areas and values of school lands and values of town lots disposed of down to March 31, 1923, after making deductions for cancelled sales, etc.

Province	Area Acres	Value	Average per acre	Value of town lots
Manitoba.....	661,011	\$ 6,393,317 62	\$ 9.67	\$ 4,793 40
Saskatchewan.....	1,435,819	24,308,374 85	16.93	13,226 00
Alberta.....	910,482	12,656,504 60	13.90	39,680 00

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The number of permits and leases issued, the number of leases in good standing and the combined revenue derived therefrom for the provinces of Manitoba, Saskatchewan and Alberta for the fiscal year is as follows—

	Permits issued	Leases issued	Leases in good standing	Revenue derived
Grazing.....	5,484	.....	.....	\$103,221 60
Coal.....	.....	30	100	18,707 94
Petroleum and gas.....	.....	215	595	17,917 31
Hay.....	2,918	3	20	8,007 21
Cultivation.....	292	.....	.....	19,179 10
Timber.....	233	.....	.....	12,780 65
Special.....	.....	5	17	1,086 56

Registration Fees.—During the fiscal year 359 assignments of sales and leases were filed and registered, covering the provinces of Manitoba, Saskatchewan and Alberta. The revenue derived from this source amounted to \$1,024.15.

The total net revenue collected for the fiscal year was as follows:—

Manitoba.....	\$ 104,990 33
Saskatchewan.....	1,015,266 00
Alberta.....	394,247 11
Total.....	\$ 1,514,503 44

The revenues collected for the fiscal year (less principal moneys and less expenditure) and paid over to the provinces of Manitoba, Saskatchewan, and Alberta were as follows:—

Province	Revenues other than principal moneys	Expenditure	Amount paid to provinces
Manitoba.....	\$ 39,415 50	\$ 15,573 78	\$ 24,041 72
Saskatchewan.....	460,308 93	46,971 43	413,337 50
Alberta.....	218,954 47	32,601 57	186,352 90

The balance standing to the credit of the School Lands Fund for each province as on March 31, 1923, and the interest paid on the investment for the fiscal year 1922-23 were as follows:—

Province	Total amount at credit of fund	Amount invested in debenture stock	Interest paid on investments, fiscal year, 1922-23
Manitoba.....	\$ 5,701,414 57	\$ 5,701,000 00	\$281,750 00
Saskatchewan.....	12,582,471 91	12,582,000 00	601,350 00
Alberta.....	6,646,344 58	6,646,000 00	323,550 00

Statements herewith lettered A, B, and C, respectively, show the revenue collected from each of the provinces of Manitoba, Saskatchewan, and Alberta for the fiscal year, duly classified.

Statements herewith lettered D, E, and F, respectively, show the balance standing to the credit of the School Lands Fund for each province as on March 31, 1923, after deducting amounts invested in Dominion of Canada Debenture Stock, as provided for by Order in Council.

STATEMENT A—Manitoba School Lands—Revenue collected for fiscal year

Source	Gross totals		Refunds	Net totals
	\$	cts.	\$	cts.
Sales—				
Principal.....	65,720	60		
Interest.....	27,581	81	93,302	41
Cultivation.....			145	77
Grazing rent.....				93,156
Timber.....				64
Less office fees transferred to Dominion Lands..		950		11
Hay.....			149	92
Less office fees transferred to Dominion Lands..	4,837	91		2,985
Petroleum and Natural Gas.....		3,135		03
Registration fees.....				
Transferred from Dominion Lands.....	49	00	12	75
Miscellaneous.....	3,153	92		4,776
				16
	769	00	101	20
		2,384		72
				647
		05		05
	124	00		
		124		00
				67
		02		02
Totals.....		105,399	409	64
				104,990
				33

STATEMENT B—Saskatchewan School Lands—Revenue collected for fiscal year

Source	Gross totals		Refunds	Net totals
	\$	cts.	\$	cts.
Sales:—				
Principal.....	557,800	65		
Interest.....	274,185	35	931,986	00
Cultivation.....			3,574	69
Grazing rent.....				928,411
Timber.....				31
Less office fees transferred to Dominion Lands		18,026		34
Hay.....			798	35
Less office fees transferred to Dominion Lands		59,677		69
Coal.....	2,002	45		58,789
Petroleum and Natural Gas.....			887	84
Registration fees.....				85
Transferred from Dominion Lands.....	58	00	57	00
Miscellaneous.....	4,966	69		1,887
		1,944		45
	1,342	00	205	69
		3,624		3,419
				00
		3,940		88
		47		8
		276		68
		68		
	315	00		315
		315		00
				1,006
		1,067		84
Totals.....		1,020,859	5,593	19
				1,015,266
				00

STATEMENT C—Alberta School Lands—Revenue collected for fiscal year

Source	Gross totals		Refunds	Net totals
	\$	cts.	\$	cts.
Sales:—				
Principal.....	186,635	92		
Interest.....	140,203	95	326,839	87
Cultivation.....			16,055	68
Grazing rent.....				310,784
Timber.....				19
Less office fees transferred to Dominion Lands..		1,184		80
Hay.....			183	80
Less office fees transferred to Dominion Lands..		42,528		12
Coal.....			1,082	12
Petroleum and Natural Gas.....	6,289	44		41,446
Registration fees.....				12
Transferred from Dominion Lands.....				
Miscellaneous.....				
	126	00	46	40
	3,252	02		6,117
		6,163		04
	807	00	140	53
		2,445		2,304
				49
		14,954		06
		44		178
				38
		17,202		38
				208
		38		80
	96	00		
	585	15		3
		681		00
				678
		191		15
		48		48
Totals.....		412,190	17,943	71
				394,247
				11

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STATEMENT D—Revenue and Expenditure, Manitoba School Lands, 1922-23.

Particulars	Dr.		Cr.	
	\$	cts.	\$	cts.
By balance on April 1, 1922.....			839	74
" sales.....			93,156	64
" cultivation permits.....			950	11
" timber dues, hay permits, grazing rental, petroleum, and miscellaneous.....			10,759	58
" registration fees.....			124	00
" interest on fund.....			1,688	11
To cost of management at Ottawa.....	7,040	82		
" salaries, printing, advertising, and general expenses.....	8,332	96		
" revenue and interest paid to Manitoba Government.....	24,041	72		
" interest on fund paid to Manitoba Government.....	1,688	11		
" investment in 5 p.c. debenture stock.....	66,000	00		
" balance, March 31, 1923.....	414	57		
	107,518	18	107,518	18

STATEMENT E—Revenue and Expenditure, Saskatchewan School Lands, 1922-23.

Particulars	Dr.		Cr.	
	\$	cts.	\$	cts.
By balance on April 1, 1922.....			514	84
" sales.....			928,411	31
" cultivation permits.....			17,227	99
" timber dues, hay permits, grazing rental, petroleum, coal and miscellaneous.....			69,311	70
" registration fees.....			315	00
" interest on fund.....			14,382	41
To cost of management at Ottawa.....	21,972	56		
" salaries, printing, advertising and general expenses.....	24,998	87		
" revenue and interest paid to Saskatchewan Government.....	413,337	50		
" interest on fund paid to Saskatchewan Government.....	14,382	41		
" investment in 5 p.c. debenture stock.....	555,000	00		
" balance, March 31, 1923.....	471	91		
	1,030,163	25	1,030,163	25

STATEMENT F—Revenue and Expenditure, Alberta School Lands, 1922-23.

Particulars	Dr.		Cr.	
	\$	cts.	\$	cts.
By balance, on April 1, 1922.....			51	94
" sales.....			310,784	19
" cultivation permits.....			1,001	00
" timber dues, hay permits, grazing rental, coal, petroleum, and miscellaneous.....			81,783	77
" registration fees.....			678	15
" interest on fund.....			5,750	48
To cost of management at Ottawa.....	15,935	65		
" salaries, printing, advertising, and general expenses.....	16,665	92		
" revenue and interest paid to Alberta Government.....	186,352	90		
" interest on fund paid to Alberta Government.....	5,750	48		
" investment in 5 p.c. debenture stock.....	175,000	00		
" balance, March 31, 1923.....	344	58		
	400,049	53	400,049	53

REPORT OF THE SUPERINTENDENT, MINING LANDS BRANCH,
H. H. ROWATT

The total revenue of the Mining Lands Branch derived from all sources during the fiscal year 1922-23 amounted to \$798,712.89. This revenue was derived from fees, royalties, and rentals, as mining rights are no longer permanently alienated from the Crown but are disposed of under terminable leases.

The decrease in revenue was due to the fact that collections made for certain natural resources in the Yukon Territory are now credited to another branch (the Northwest Territories and Yukon Branch), and that expenditures incurred by lessees in the search for oil in the western provinces, amounting to \$570,806.95, were accepted in satisfaction of the rental of the leases affected.

Statements lettered A and B, showing in different forms how the revenue is made up, will be found at the end of this report. The statement lettered A shows the total revenue, and the statement lettered B shows the revenue collected at each agency, including the Yukon Territory.

The revenue of the Yukon Territory for the fiscal year, derived from mining rights only, amounted to \$74,275.19.

The report for the fiscal year from the Gold Commissioner of the Yukon Territory, dealing with mining in that territory, is submitted.

Petroleum and Natural Gas.—There are now in force under the regulations 7,402 petroleum and natural gas leases, embracing a total area of 1,750,391 acres, distributed as follows: In Manitoba, 126 leases, comprising 30,780 acres; in Saskatchewan, 160 leases, comprising 92,444 acres; in Alberta, 6,113 leases, comprising 1,467,560 acres; in British Columbia, 1,003 leases, comprising 159,607 acres; and in the North West Territories, 144 leases, comprising 98,612 acres, and 123 permits, comprising 191,416 acres. The total area under lease and permit in the North West Territories is 290,028 acres. The total revenue derived from petroleum lands during the year amounted to \$306,688.82.

The total number of leases which have been issued under the provisions of the petroleum and natural gas regulations is 26,185, and the total revenue derived from this source since the beginning is \$3,722,922.77. The total expenditure applied in lieu of rental during the same period was \$1,310,214.75.

Natural gas in large quantity in widely different fields has been discovered, and its use for domestic and industrial purposes in different parts of the western provinces is increasing. As the gas produced in the Turner Valley field of Alberta contains gasolene in commercial quantity, an absorption plant for the recovery of such product has been installed and is in active operation, all the gasolene content being extracted before the gas is piped to Calgary for domestic consumption.

The discovery of oil in quantity in the Keven-Sunburst field of northern Montana, adjoining the International Boundary, has given a very considerable impetus to prospecting in southern Alberta.

Coal.—Regulations for the sale of coal mining lands were withdrawn a number of years ago and all sales made under the provisions of such regulations have now been completed. The total amount of revenue collected from the sale of coal mining lands was \$1,565,632.08.

Coal Leases.—The total number of coal mining leases in force at the close of the fiscal year was 707, comprising a total area of 263,214 acres, distributed as follows: In Manitoba, 1 lease, comprising 80 acres; in Alberta, 614 leases, comprising 247,012 acres; in Saskatchewan, 89 leases, comprising 11,992 acres; in British Columbia, 2 leases, comprising 4,090 acres; and in the Yukon Territory, 1 lease, comprising 40 acres. The total number of coal mining leases

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issued during the year was 124, comprising 25,244 acres. The total revenue collected during the year for rental of coal mining rights was \$178,297.54.

Royalty on Coal.—Under the regulations governing the issue of leases to mine coal, the royalty is fixed at five cents per ton of 2,000 pounds on the merchantable output of the mine. The following is a statement showing the amount collected on account of royalty on coal mined from lands in the western provinces, the Northwest Territories, and the Yukon Territory, respectively, during each year since the regulations came into effect:—

Year	Alberta	Saskatchewan	British Columbia	Yukon Territory	Northwest Territories
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
1903-04	56 90	Nil	Nil	22 40	Nil
1904-05	2,822 00	110 70	"	47 00	"
1905-06	2,379 75	47 10	"	569 33	"
1906-07	3,865 26	74 20	"	517 34	"
1907-08	7,621 67	4 30	"	1,543 38	"
1908-09	5,322 39	358 11	"	371 73	"
1909-10	153,559 98	1,672 50	3 00	136 38	"
1910-11	218,932 88	2,184 74	3 50	125 00	"
1911-12	104,894 55	2,034 74	2 78	390 00	"
1912-13	142,997 79	3,145 72	6 95	1,069 11	"
1913-14	147,198 75	2,123 43	19 35	Nil	"
1914-15	104,489 77	1,880 06	4 90	"	"
1915-16	67,190 17	2,601 52	3 50	"	5.10
1916-17	149,447 82	2,228 08	8 92	"	Nil
1917-18	144,634 75	4,046 55	Nil	"	6.00
1918-19	175,687 66	3,193 05	"	"	Nil
1919-20	181,641 80	2,573 32	"	"	"
1920-21	190,545 80	2,703 41	"	"	"
1921-22	185,436 88	3,309 86	"	"	"
1922-23	171,723 83	3,035 18	"	"	"

The total revenue derived from coal mining lands on account of rental, royalty, and application fees, during the fiscal year, amounted to \$355,132.55.

Quartz and Placer Mining.—During the fiscal year 1,331 entries for quartz and 356 entries for placer mining claims were granted by the mining recorders in Manitoba, Saskatchewan, and Alberta, and by the mining recorder for the Northwest Territories. The total revenue derived from these claims was \$50,494.37.

In the Yukon Territory during the fiscal year 78 entries for placer mining claims, 121 relocations and 2,553 renewals were recorded. The revenue from these sources and from fees for registering documents in connection with mining properties was \$42,746. During the same period 382 quartz mining claims were granted in the said Territory, and 1,397 renewals issued, the revenue derived from which amounted to \$17,053.

The rich silver-lead deposits of the Mayo-Keno District of the Yukon Territory are being rapidly developed, notwithstanding the remoteness of the region in which these deposits lie and the difficulties of transportation. A large quantity of high grade ore was mined during the winter months and prepared for shipment to the Pacific smelters with the opening of navigation. The cost of the mining, transportation, and treatment is about \$100 per ton of ore shipped. Development of the mineral deposits of northern Manitoba is also progressing.

Quarrying.—The number of leases now in force, issued under the provisions of the regulations, is 206, distributed as follows: In Manitoba, 77 leases, comprising 1,984 acres; in Saskatchewan, 32 leases, comprising 1,011 acres; in Alberta, 60 leases, comprising 3,164 acres; and in British Columbia, 37 leases,

comprising 1,109 acres. The total revenue collected during the fiscal year on account of quarrying and clay leases, including the application fees, amounted to \$6,506.16.

Alkali.—The alkali regulations apply to natural accumulations of soluble mineral salts, comprising for the most part sodium and magnesium sulphates found in a comparatively pure condition in certain of the sloughs and shallow lakes of southern Saskatchewan. Under the provisions of these regulations 16 leases have been granted, comprising a total area of 4,718 acres, and the revenue derived from this source during the fiscal year amounts to \$1,388.85.

Royalty on Gold Mined in the Yukon Territory.—The total amount collected up to March 31, 1923, for royalty on gold, the output of placer mining claims in the Yukon Territory, after deducting the exemption at one time allowed under the regulations, was \$4,842,666.31, of which amount \$25,819.04 was collected during the last fiscal year. For the purpose of estimating royalty, the gold is valued at \$15 an ounce, which is much below its real value.

Assuming that gold on which royalty has been paid has an average value of \$20 per ounce, the value of gold produced from placer mining operations in the Yukon Territory, up to March 31 last, might be placed at \$161,375,000.

Dredging.—Ten leases to dredge for minerals in the beds of rivers in the Yukon Territory are now in force, including a total river stretch of 39.43 miles. The total revenue derived from this source up to March 31, 1923, amounted to \$201,531.42, of which amount \$144.30 was collected during the fiscal year just closed. These dredging leases comprise portions of the Yukon, Fortymile, and Klondike rivers.

For the purpose of gold recovery there are at present five dredges engaged in mining in the Yukon Territory, all of which are being operated by hydro-electric motive power. Two of these dredges are of large capacity, capable of excavating and treating 15,000 cubic yards of gravel per day.

Sixteen leases to dredge for minerals in the submerged beds of rivers in the provinces of Manitoba, Saskatchewan, and Alberta are now in force, covering a total frontage of sixty-nine miles. Of these leases, thirteen are in Alberta and include sixty-two miles; two in Saskatchewan, including six miles; and one in Manitoba, including one mile. The total revenue derived from this source up to March 31, 1923, amounted to \$51,187.47, of which amount \$460 was collected during the past fiscal year.

Hydraulic Mining.—The regulations for the disposal of hydraulic mining locations in the Yukon Territory were withdrawn by an Order in Council dated February 4, 1904. The leases then in force were not affected by such withdrawal. There are still five hydraulic mining locations held under leases, comprising a total area of 15.03 square miles. Rentals, amounting to \$161,237.43, have been collected on account of such locations and the amount paid on this account during the fiscal year was \$5,436.35.

Water Rights.—There are now in force in the Yukon Territory 488 grants to divert water for mining purposes under the provisions of the Yukon Placer Mining Act, aggregating a total of 120,445 miner's inches.

Tar Sands.—The total revenue derived from the disposal of tar-sand rights amounts to \$39,766.62. There are four leases in force, comprising a total area of 5,566.5 acres in the province of Alberta. Research work is still being conducted for the discovery of the most efficient method for the commercial recovery of oil and other hydro-carbons from these sands. The revenue for the current year derived from this source amounts to \$1,487.50.

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REPORT OF THE GOLD COMMISSIONER, DAWSON, YUKON TERRITORY, REGARDING
MINING

Placer Gold Mining.—The export tax was paid on 68,850.68 ounces of gold during the fiscal year, and as practically all the gold mined is exported, this amount may for practical purposes be considered the total amount mined. Production from the hydraulic mines was very materially affected by the exceptionally early and severe frosts which entirely shut off the water supply before the cuts could be cleaned up in a number of instances.

Yukon Gold Company.—This company operated one dredge on Gold Run creek during a dredging season of 130 days from May 25 to September 29, handling 578,395 cubic yards of material.

Eight hydraulic mines were operated at the following points:—Adams Hill, King Solomon, Oro Fino Hill, Trail Gulch, Lovett-Hosford, American Gulch, Cheechaco and Gold Hill, and 1,586,666 cubic yards were handled.

The hydro-electric power plant of the company on the Twelvemile river furnished adequate power for the dredging and other operations of the company requiring power. The daily average of men employed during the mining season (April to October) was as follows:—dredges and thawing, 47; hydraulic mines, 42; ditches, 31; otherwise employed, 23; total, 143.

Burrall and Baird, Limited.—This company operated dredges Canadian Nos. 2 and 4 in the Klondike valley on Hydraulic Mining Leasehold No. 18 and Dredging Lease No. 24. Dredge No. 2 operated from the 14th of May to the 23rd of September, handling 1,559,329 cubic yards of material. Dredge No. 4 operated from the 12th of May to the 14th of December, handling 2,260,114 cubic yards.

In addition to these major operations, prospecting was carried on with a Keystone drill and a prospecting tunnel was driven 940 feet into Jackson Hill with a view of carrying on hydraulic operations at this point during the coming summer.

The pumping plant of the company near the mouth of Hunker creek was in operation during the summer. The company's machine shops at Bear creek, and other auxiliary work were carried on as usual. An average of 76 men was employed by this company throughout the season.

The New North West Corporation, Limited.—This company operated dredge North West No. 1 on Below Lower Discovery, Dominion creek from the 27th of May to the 8th of November, and dredged in that period 373,064 cubic yards of material. Dredge North West No. 2 operated on the Granville Flat on Dominion creek from the 3rd of June to the 7th of November, and handled 582,296 cubic yards of material.

The hydro-electric power plant of the company at the North Fork of the Klondike river furnished an adequate supply of power for the operation of these dredges, machine shops, etc., and also the dredges of the Burrall and Baird, Limited, operating in the Klondike valley. An average of 115 men was employed by this company throughout the season.

Hihet Mining Company, Limited.—This company, the successor of the Titus Dredging Company, operated their dredge on Hihet creek throughout the season. An average of 20 men was employed in this operation.

Other Placer Operations.—Mr. Neville A. D. Armstrong carried on extensive prospecting operations on Russell creek, a tributary of the MacMillan river, and reports a large area of ground suitable for dredging operations. Further work will be carried on during the coming summer.

Collins, Weinburg and Collins operated their ground on Miller creek in an extensive manner, both winter operations, and hydraulicking during the summer, being carried on with very satisfactory results.

In general the individual operations carried on throughout the various parts of the Camp were satisfactory to the operators.

Lode Mining.—The confidence expressed in last year's report on the future development of silver-lead mining on Keno Hill and vicinity in the Upper Stewart District is amply borne out by the past year's operations.

The development on the Keno Hill, Limited property has been satisfactory. The company has mined and hauled to Mayo for shipment on the opening of navigation approximately 4,300 tons of high grade ore, and in addition has blocked out ore for another year's operations on a larger scale. Prospecting on the "Friendship" and "Sadie" claims owned by this company has opened up bodies of high grade ore. Eighty-five men were employed by the company in these operations.

The properties purchased by Mr. F. W. Bradley, known as the Wernecke Group, have been taken over by the Treadwell Yukon Company, Limited, organized for that purpose. Development work on these properties has been vigorously prosecuted throughout the year, the results exceeding all expectations. The plans formulated by the company in September last contemplated mining and shipping 2,000 tons of ore during the present winter. Such large high grade ore bodies, however, were developed during the winter that the company was able to mine and haul to Mayo approximately 4,500 tons of ore, in addition to which large quantities of shipping ore were mined that on account of lack of transportation it has not been possible to haul to Mayo.

This company has revolutionized winter transportation in this country by the introduction of tractors. One ten-ton tractor has hauled 4,500 tons of ore forty-five miles and as a back haul freighted wood for use in and about the mine. As much as 80 tons of ore has been hauled to Mayo in one load. While exact figures are not available, it is assumed that ore may be hauled by tractors for 25 per cent of the cost of hauling with horses. Tractors will be used exclusively for hauling ore in the future.

The two companies referred to are the only large shippers of ore, but high grade ore has been developed on a number of other properties, and shipments averaging from 25 to 100 tons were hauled to the landing at Mayo for shipment.

In general, it may be said that the development during the year has been entirely satisfactory. The plans now being made for next year contemplate the mining and hauling to Mayo of approximately 15,000 tons of high grade ore, and it is confidently expected by the operators that in the extraction of these ores sufficient milling ore will be developed to warrant the installation of a mill.

Coal. The Five Fingers Coal Company operated a mine at the Tantalus butte on the opposite side of the river from the old Five Fingers coal mine, and shipped a limited quantity of coal to Dawson. They anticipate having sufficient coal on the market this year to meet all requirements.

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STATEMENT A—Statement of receipts on account of coal and minerals in the western provinces and territories for the fiscal year.

Petroleum.....	\$ 306,688 82
Quartz rental.....	938 66
Coal mining fees.....	2,076 00
Coal royalty.....	174,759 01
Coal rental.....	178,297 54
Mining fees (quartz and placer).....	92,301 71
Hydraulic leases (Yukon).....	5,436 35
Dredging leases (western provinces).....	460 00
Dredging leases (Yukon).....	144 30
Gold export tax.....	25,819 04
Free certificates, export of gold.....	16 50
Stone quarrying.....	6,506 16
Registration and office fees.....	1,994 60
Gypsum.....	50 00
Alkali.....	300 55
Potash.....	206 00
Tar sands.....	1,507 50
Sand stone and gravel permits.....	35 00
Improvements.....	350 00
Interim receipt account.....	808 00
Miscellaneous.....	17 15
Total.....	\$ 798,712 89

STATEMENT B—Statement showing the total amount of revenue from minerals collected at each agency in the western provinces and territories for the fiscal year.

Battleford.....	\$ 978 22
Calgary.....	176,224 82
Dauphin.....	7,199 65
Edmonton.....	198,009 95
Grande Prairie.....	14,108 27
Kamloops.....	379 93
Lethbridge.....	210,665 20
Moose Jaw.....	7,461 38
New Westminster.....	33,300 72
The Pas (Manitoba).....	20,872 40
The Pas (Saskatchewan).....	3,627 00
Peace River.....	11,832 93
Prince Albert.....	22 00
Revelstoke.....	364 20
Saskatoon.....	1,026 50
Swift Current.....	7,394 98
Winnipeg.....	14,071 43
Fort Smith (N.W.T.).....	16,898 12
Dawson (Gold Commissioner's office).....	47,381 65
Dawson (Royalty Collector's office).....	25,755 69
Whitehorse (Mining Recorder's office).....	1,073 50
Whitehorse (Royalty Collector's office).....	64 35
Total.....	\$798,712 89

REPORT OF THE CONTROLLER, TIMBER AND GRAZING LANDS
BRANCH, B. L. YORK

The revenue derived from timber, grazing, and hay lands during the fiscal year ending the 31st March, 1923, amounted to \$886,064.37. This is an increase of \$162,741.56 over the revenue received for the previous fiscal year.

REVENUE FOR FISCAL YEAR 1922-23

<i>Timber—</i>	
Bonus under license.....	\$ 166,408 37
Rent.....	75,234 00
Royalty.....	281,516 32
Permit fees, dues and rentals.....	175,624 81
Seizure dues.....	10,115 02
Scaling fees.....	6,922 56
Scale books.....	78 00
License fees.....	1,078 18
Total for timber.....	\$ 716,977 26

REVENUE FOR FISCAL YEAR 1922-23—Concluded

Brought forward	\$ 716,977 26
Grazing, hay, etc—	
Grazing.....	\$ 113,896 94
Hay.....	17,203 84
Registration fees.....	555 66
Fireguarding dues.....	35,411 17
Improvements.....	2,019 50
Total for grazing, etc.....	\$ 169,087 11
Total revenue.....	\$ 886,064 37

The following statements show the total revenue from the Crown timber agencies, the number of mills operated, the quantities of timber manufactured, the area of lands held under license, and the number and area of grazing leases. The report of the Superintendent of Dominion Timber Agencies is also attached.

The revenue from timber, grazing, and hay lands received at the Crown timber agencies, and the number of mills operated under license and permit were as follows:—

Agency	Total Revenue	Number of Mills operating under license	Number of Mills operating under permit
	\$ cts.		
Calgary ..	49,025 05	11	15
Edmonton.....	112,050 81	31	128
Prince Albert.....	227,159 75	24	63
Winnipeg	97,736 91	23	35
Kamloops.....	37,822 36	4	
New Westminster ...	178,627 50	33	
Revelstoke.....	49,294 64	12	8

TIMBER

The returns of operations show the quantities of lumber and other material manufactured and marketed under license and under permit to be as follows:—

Material	Under License		Under Permit	
	Manu- factured	Sold	Manu- factured	Sold
Lumber, ft. b. m.....	254,042,349	265,108,892	17,784,290	22,244,104
Laths, M.....	28,816,186	26,973,310	3,947,571	3,958,571
Shingle bolts, cords ..	35,078	25,638	2,904	
Shingles, M.....			945,250	574,250
Railway ties, number.....	327,696	453,812	354,615	346,290
Fence-posts, number.....	107,474	5,325	24,196	7,462
Cordwood, cords.....	14,121	42,296	3,034	4,256
Lagging, cords	300	271	896	
Mine ties, pieces	400	400		
Mining timber, linear feet.....	1,774,987	1,797,425	183,502	868,038
Boom timber and building logs, linear feet.	16,110	1,860	9,442	7,972
Piling, poles, and cribbing, linear feet.....	132,503	48,213	59,351	42,306
Slabs, cords...			540	540
Roof poles, number			176	176
Fence rails, number.....			1,114	1,114
Lath bolts, cords			884	868

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The areas of lands held under license and under permit in the provinces of Manitoba, Saskatchewan, Alberta, and British Columbia are as follows:—

Province	Under license	Under permit
	sq. miles	sq. miles
Manitoba	1,024·67	422·57
Saskatchewan	918·51	144·41
Alberta	1,827·65	272·68
British Columbia	1,717·19	14·44
	5,488·02	854·10

During the year 183 berths were granted as follows: 7 license berths, 32 portable sawmill berths, 65 cordwood berths, 73 fire-killed berths, 6 permit berths.

GRAZING

There were 6,980 grazing leases in force during the year covering an area of 6,324,644 acres, made up as follows: Manitoba, 103,046 acres; Saskatchewan, 2,814,913 acres; Alberta, 2,925,582 acres; British Columbia, 499,103 acres. During the year 639 new leases were issued.

REPORT OF SUPERINTENDENT OF DOMINION TIMBER AGENCIES, E. F. STEPHENSON

STATEMENT A—Timber products manufactured by holders of timber berths on Dominion Lands under yearly license and permit during the fiscal year.

LICENSE BERTHS

Agency	Lumber	Lath	Railway ties	Shingle bolts	Round timber	Saw logs	Fence posts
	M.ft.B.M.	M.	No.	Cords	Pieces	Pieces	No.
Calgary.....	13,467	2,931,900	219,302	.	1,059,833	320,889	.....
Edmonton.....	22,525	8,265,876	197,735	.	384,366	364,290	.....
Kamloops.....	12,189	.	873	1,247	61,327	103,845	40,000
New Westminster	117,625	.	29,513	33,169	48,440	163,566	.....
Prince Albert.....	41,382	11,867,460	24,486	.	.	645,995	.....
Revelstoke ..	33,272	.	1,100	662	22,999	282,205	62,911
Winnipeg	13,582	5,750,950	2,346	.	.	235,298	.....
Totals.....	254,042	28,816,186	475,355	35,078	1,576,965	2,116,088	102,911

PERMIT BERTHS

Calgary.....	530	1,941,650	53,399	...	7,416	18,694	.....
Edmonton ..	8,898	1,984,921	263,913	2,363	203,448	171,158	.....
Kamloops ..	.	.	.	.	.	.	.....
New Westminster..	.	.	.	.	.	.	.....
Prince Albert.....	1,575	1,768,000	13,531	.	.	38,894	.....
Revelstoke ..	409	.	.	543	17,547	4,750	.....
Winnipeg.....	6,373	.	29,614	.....	.....	165,866	.....
Totals.....	17,785	3,947,571	360,457	2,906	228,411	399,362	.....
Grand totals.....	271,826	32,763,757	835,812	39,684	1,805,376	2,515,450	.....
Previous year	230,200	25,587,495	740,270	36,261	4,252,089	2,435,316	.....

STATEMENT B—Timber material cut on Dominion Lands covered by permits issued at the respective Agencies (principally to settlers), during the year.

Agency	Lumber and Logs	Fence Rails	Poles, Number of pieces	Fence Posts	Cord-wood	Rail-way Ties	Poles, tele-graph and Tele-phone	Round Timber	Shingle Bolts	Lath
	Ft. B.M.	No.		No.	Cords	No.	No.	L. ft.	Cords	M.
Battleford	714,597	20,760	5,720	15,125	992					
Calgary	5,419,988	21,592	9,430	59,925	4,770	32,116	6,666	8,560 315	100	
Dauphin	4,130,231	8,000	1,230	8,378	15,812	5,000		2,320		700
Edmonton	7,865,521	401,738	77,321	147,557	2,057	370 898	9,817	2,726,679	127	250
Grande Prairie	878,284	182,146	36,867	42,355	137					
Kamloops	7,014,394	970		102,007	3,380	49 855	23,970		100	
Lethbridge	1,071,165	2,975	8,142	36,988	3,840	3,000		326,554		
Moose Jaw	7,900	2,250	425	6,267	827					
New Westminster	4,143,408			310	300			33,955	5,333	
Peace River	1,537,374	308,646	31,310	52,435	3,750	5,346	120			
Prince Albert	18,381,642	116,880	27,005	130,314	40,411	43,815	70		12	384
Revelstoke	1,157,067		350	75,090	953	16,234	1,234		924	
Saskatoon	657,072	2,600	800	14 923	634					
Swift Current	89,916	22,238		21,362	2 749					
Winnipeg	8,980,829	8,430	2,642	40,487	37,370	20,337	1,300		76	1,850
Totals	62,049,388	1,099,219	201,242	753,213	117,991	546,901	43,181	11,649,823	6,672	3,184
Previous year	56,407,542	1,775,989	327,060	1,056,890	117,706	534,148	108,552	11,410,259	5,870	

STATEMENT D –Number of Hay Permits issued at the respective Crown Timber Offices and the amount of hay covered thereby for the fiscal year.

Agency	Dominion Lands		School Lands		Forestry Lands		Revenue from Hay
	Permits issued	Tons Hay	Permits issued	Tons Hay	Permits issued	Tons Hay	
							\$ cts.
Battleford	318	3,415	234	2,920	31	1,549	3,063 49
Calgary	215	4,018	202	2,171	9	190	2,775 97
Dauphin	189	4,488	176	2,341	228	3,575	2,664 00
Edmonton	1,040	8,894	419	4,445	32	1,145	5,005 40
Grande Prairie	394	3,279	89	678			1,430 25
Kamloops	24	120			28	296	176 25
Lethbridge	42	1,221	41	438	1	10	295 16
Moose Jaw	362	5,232	432	4,881	53	1,402	3,312 64
New Westminster							
Peace River	405	4,689	62	962	4	356	2,000 04
Prince Albert	398	3,163	180	1,415	76	2,183	2,422 80
Revelstoke							
Saskatoon	234	2,506	357	2,670	72	2,121	2,875 10
Swift Current	173	4,992	158	1,933	7	155	1,142 05
Winnipeg	568	5,362	594	6,730	127	2,367	7,895 60
Totals	4,362	51,379	2,949	31,584	668	15,349	35,058 75
Previous year	5,430	63,993	3,644	46,107	833	20,541	35,253 31

REPORT OF THE SUPERINTENDENT, ORDNANCE, ADMIRALTY, AND RAILWAY LANDS BRANCH, JOS. P. DUNNE.

In the past many of the departments acquired lands for public purposes and in course of time a proportion of these parcels have become unnecessary for the purpose for which acquired. As the Government endeavours to put all its assets to the best use these lands no longer required are being disposed of by sale, or rented, if sale is not immediately feasible.

According to statute one of the many functions of the Department of the Interior is the sale or rental of such lands and this work is the special duty

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of the Ordnance, Admiralty, and Railway Lands Branch. The lands are taken over from the various departments and disposed of to the best advantage. During the year there was increased activity in this part of the work which will doubtless be reflected in future reports.

Many of the plans of the lands administered by the Branch, being very old, out-of-date or inadequate for present-day requirements, it was found necessary to have a fresh survey made of these properties, the majority of which are situated in the province of Ontario. Retracement surveys were made at Prescott and Hamilton and on the Government reserve at Burlington, and surveys were made of lands originally acquired in connection with the Rideau canal and no longer required for canal purposes. When the surveys and plans are completed, the records will be in excellent shape and the efficiency of administration will be correspondingly increased.

During the fiscal year the activities of the Railway Lands Division were chiefly directed towards the final adjustment of the various land subsidy accounts of the railway companies. An examination of the railway land subsidy records is progressing with a view to listing formerly water-covered areas. Many of these will be used to satisfy the arrears still due on account of railway land subsidies. Each patent for surface rights issued to the Canadian Northern Railway Company on its land subsidy account has been examined and also each individual contract between the railway company, and the purchaser of the land.

An area of approximately 200,000 acres was patented during the year in satisfaction of land subsidy grants, a number of lots in Government townsites sold, and one new townsite placed on the market.

The recording, copying and filing of Orders in Council affecting the Department of the Interior was carried on as usual.

The statements following show the number of lots dealt with in the fiscal year, the amount of principal and interest accrued and the amounts received in connection with the same.

STATEMENT A—Number of lots and part lots sold or redeemed during the fiscal year.

Locality	Number of lots sold or redeemed	Amount of consideration or purchase money	Amount received on account	Remarks
Edmundston.	Pts. 1, 2, 3, 4, 5, Lots 6, 7, 8, 9	\$ 1,536 30	\$ 1,536 30	On account
Grand Falls	1 lot	105 00	105 00	In full
Ottawa.....	1 lot	100 00	100 00	In full
Ottawa.....	1 lot	180 00	180 00	In full
Ottawa.....	4 lots	2,175 00	402 22	On account
Ottawa ..	$\frac{1}{2}$ lot	90 00	90 00	In full
Ottawa	1 lot	202 60	40 00	On account
Port Maitland.....	1 lot	64 67	64 67	In full
Quebec.....	1 lot	50 00	50 00	In full
St. Croix.....	Reserve	136 30	136 30	In full
Totals.....		4,639 87	2,704 49	

STATEMENT B—Localities where Ordnance Lands are situated on account of which moneys have been received during the fiscal year.

Locality	Amount	Locality	Amount
	\$ cts.		\$ cts.
Burritt's Rapids.....	5 24	Brought forward.....	4,359 12
Burlington Beach.....	502 00	Old Sly's Rapids.....	4 00
Chambly.....	2 06	Port Maitland.....	108 46
Edmundston.....	1,537 30	Prescott.....	2 00
Elmsley.....	3 60	Patterson's Creek.....	1 00
Grand Falls, N.B.....	150 15	Quebec.....	880 00
Grenville.....	2 00	Queenston.....	3 00
Hamilton.....	5 50	Shelburne, N.S.....	6 00
Kingston.....	204 50	St. Joseph's Island.....	237 42
Kemptville.....	62 00	St. Croix River.....	136 30
Long Island.....	2 00	Sorel.....	104 00
Nepean.....	2 00	Smiths Falls.....	54 00
Niagara Falls.....	6 00	Tenby Bay.....	5 00
Owen Sound.....	16 50	Township of Marlborough ..	21 35
Ottawa.....	1,858 27		
Carried forward.....	4,359 12	Total.....	5,921 65

STATEMENT C—Receipts for the fiscal year, classified.

Rent.....	\$ 2,563 16
Principal.....	2,738 63
Fees, interest, etc.....	619 86
Total.....	\$ 5,921 65

STATEMENT D—Amounts due and unpaid on account of purchase money and rent or interest for the fiscal year.

Locality	Rent	Principal	Interest	Total
	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Amherstburg.....	2 00			2 00
Beaver Harbour.....	2 00		0 12	2 12
Burlington Beach	100 00		28 00	128 00
Dalhousie			1 61	1 61
Elmsley	2 10		0 77	2 87
Grand Falls.....	67 60		7 94	75 54
Grenville	0 20			0 20
Marlborough	0 36			0 36
Montreal			15 60	15 60
Nepean		1,310 00	291 70	1,601 70
Niagara.....			35 47	35 47
Oromocto.....	0 25			0 25
Ottawa	79 85		74 56	154 41
Owen Sound	32 50		1 58	34 08
Oxford.....	0 50		0 32	0 82
Port Maitland	17 59	97 04	26 00	140 63
Presqu'Ile, N.B.....	0 50		2 73	3 23
Shelburne.....	3 00			3 00
Smiths Falls.....	50 00			50 00
Sorel.....	17 68	4,819 35	2,409 28	7,246 31
Tay.....	4 00		25 48	29 48
Wolford.....	6 80		49 17	55 97
Totals.....	386 93	6,226 39	2,970 23	9,583 55

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REPORT OF THE FINANCIAL CONTROLLER, P. MARCHAND

STATEMENT of net revenue collected from various sources for the fiscal year 1922-1923

A—Dominion Lands, including Yukon	\$ 2,348,615 34
B—School Lands	1,514,503 44
C—Ordinance Lands	5,921 65
D—Registrars' fees	415 10
E—Casual Revenue	19,896 77
F—Seed grain and Relief Repayments	248,834 96
G—Fines and Forfeitures	2,607 46
H—Sales of railway lands	1,590 00
	<u>\$4,142,384 81</u>

Statement I shows the revenue from Dominion Lands classified under subheads.

Statement J is a comparison between the revenue from Dominion Lands for the present fiscal year and that of the previous fiscal year.

STATEMENT A—Dominion Lands Revenue (Cash and Scrip) for the fiscal year 1922-23

Agencies	Cash		Scrip		Total	
	\$	cts	\$	cts	\$	cts
<i>Dominion Lands Agencies</i>						
Battleford	26,837	24			26,837	24
Calgary	45,884	81			45,884	81
Dauphin	5,842	03			5,842	03
Edmonton	30,679	35	100 00		30,779	35
Grande Prairie	4,820	32			4,820	32
Kamloops	5,049	72			5,049	72
Lethbridge	14,400	87			14,400	87
Moose Jaw	136,199	98			136,199	98
New Westminster	3,161	46			3,161	46
Peace River	5,391	07			5,391	07
Prince Albert	18,182	32	720 00		18,902	32
Revelstoke	1,722	08			1,722	08
Saskatoon	46,999	81			46,999	81
Swift Current	136,430	89			136,430	89
Winnipeg	16,138	62	80 00		16,218	62
Miscellaneous	19,343	25			19,343	25
	517,083	82	900 00		517,983	82
<i>Crown Lands Agencies</i>						
Battleford					10,872	58
Calgary					70,475	59
Calgary Irrigation Office					802	00
Dauphin					21,789	87
Edmonton					147,268	79
Grande Prairie					5,677	43
Indian Head					2,044	71
Kamloops					30,329	55
Lethbridge					53,959	16
Moose Jaw					16,635	17
New Westminster					178,627	50
Peace River					6,016	81
Prince Albert					260,667	88
Revelstoke					43,860	43
Saskatoon					5,672	44
Swift Current					45,396	68
Petawawa Military Reserve					442	75
Winnipeg					103,678	63
					<u>1,004,217</u>	<u>97</u>

STATEMENT A--Dominion Lands Revenue (Cash and Scrip) for the fiscal year
1922-23--Concluded

Agencies		Total
		\$ cts.
<i>Mining Agencies--</i>		
Battleford.....		978 22
Calgary.....		176,505 82
Dauphin.....		7,299 75
Edmonton.....		197,384 95
Grande Prairie.....		14,108 27
Kamloops.....		379 93
Lethbridge.....		210,665 20
Moose Jaw.....		7,461 98
New Westminster.....		33,906 23
Peace River.....		11,832 93
Prince Albert.....		22 00
The Pas.....		24,451 90
Revelstoke.....		364 20
Saskatoon.....		1,026 50
Swift Current.....		7,394 98
Winnipeg.....		17,132 84
		710,915 70
<i>Canadian National Park</i>		
Antelope Park.....		572 80
Buffalo Park.....		130 00
Elk Island Park.....		98 50
Fort Anne Park.....		31 00
Glacier Park.....		405 32
Jasper Park.....		5,708 80
Kootenay Park.....		88 20
Moose Mountain Buffalo Reserve.....		55 20
Point Pelee Park.....		3 00
Rocky Mountains Park.....		62,975 25
Vidal's Point Park.....		27 00
Waterton Lakes Park.....		3,472 83
Yoho Park.....		1,669 54
Miscellaneous.....		67 15
		75,304 59
<i>Northwest Territories--</i>		
General sales of land.....		784 39
Registration fees.....		29 00
Suspense account.....		1,689 05
Liquor permit fees.....		231 40
Traders' licenses.....		1,180 00
Trappers' licenses.....		4,433 00
Timber dues.....		1,876 54
Hay dues.....		6 00
Mining fees.....		5,571 81
Petroleum.....		10,987 31
Rentals.....		11 00
		26,799 50
<i>Yukon Territory</i>		
Homestead fees.....		40 00
General sales of land.....		1,733 34
Rentals.....		6,334 70
Map sales office and registration fees.....		32 50
Interim receipt account.....		242 00
Timber dues.....		13,836 38
Hay permits.....		24 45
Mining fees.....		42,726 00
Coal royalty and fees.....		40 00
Dredging leases.....		144 30
Export tax on gold.....		25,819 04
Free certificates for export of gold.....		16 50
Hydraulic leases.....		5,436 35
Quartz rental.....		120 00
		96,545 56
Total revenue (including cash \$2,430,867.14 and scrip \$900) ...		2,431,767 14
Less refunds.....		83,151 71
Net Revenue		\$2,348,615 43

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STATEMENT B—School Lands Revenue for the fiscal year 1922-23

Province	Gross Revenue	Refunds	Net Revenue
	\$ cts.	\$ cts.	\$ cts.
Manitoba.....	105,399 97	409 64	104,990 33
Saskatchewan.....	1,020,859 19	5,593 19	1,015,266 00
Alberta.....	412,190 82	17,943 71	394,247 11
	1,538,449 98	23,946 54	1,514,503 44

STATEMENT C—Ordinance Lands Revenue for the fiscal year 1922-23

Fiscal year	Gross Revenue	Refunds	Net Revenue
	\$ cts.	\$ cts.	\$ cts.
1922-1923.....	6,132 79	211 14	5,921 65

STATEMENT D—Registrar's Fees for the fiscal year 1922-23

Registration District	Gross Revenue	Land Assurance Fund	Net Revenue
	\$ cts.	\$ cts.	\$ cts.
Northwest Territories	6 00	0 40	5 60
Yukon Territory.....	448 00	38 50	409 50
	454 00	38 90	415 10

STATEMENT E—Casual Revenue for the fiscal year 1922-23

Fiscal year	Gross Revenue	Refunds	Net Revenue
	\$ cts.	\$ cts.	\$ cts.
1922-1923.....	20,060 18	163 41	19,896 77

STATEMENT F-- Net Repayments of Seed Grain and Relief Mortgages for the fiscal year 1922-23

Year	Gross Collections	Refunds	Net Receipts
	\$ cts	\$ cts	\$ cts
1876	63 39		63 39
1886-7-8.....	603 20		609 20
1890.....	447 75		447 75
1894.....	1,456 01	43 08	1,412 93
1895.....	2,181 48	56 27	2,125 21
1896.....	731 09	13 45	717 64
1900.....	137 62	2 70	134 92
1901.....	121 24		121 24
1905.....	90 37		90 37
1908.....	4,318 87	5 51	4,313 36
1909.....	444 25	2 32	441 93
1911.....	1,905 52	74 20	1,831 32
1912.....	2,532 25	1 46	2,530 79
1913.....	398 69		398 69
1914.....	507 05	2 86	504 19
1915 seed grain.....	113,758 41	2,468 13	111,290 28
1915 relief.....	69,662 69	1,039 27	68,623 42
1917.....	2,270 53	70 07	2,200 46
1918.....	12,385 21	190 41	12,194 80
1919.....	10,664 77	151 94	10,512 83
1920 seed grain.....	8,516 52	52 82	8,463 70
1920 relief.....	12,382 03	1,698 96	10,683 07
1921 seed grain.....	1,670 23		1,670 23
1921 relief.....	563 00		563 00
1922 seed grain.....	326 40		326 40
1922 relief.....	5,181 57	50 75	5,130 82
Relief advances prior to 1915.....	1,476 09	43 07	1,433 02
	254,802 23	5,967 27	248,834 96

STATEMENT G—Fines and Forfeitures for the fiscal year 1922-23

Authority for Imposition of Penalty	Gross Revenue	Refunds	Net Revenue
	\$ cts	\$ cts	\$ cts
Northwest Territories Act.....	357 40	20 00	337 40
North West Game Act.....	170 00		170 00
Migratory Birds Convention Act.....	482 50	30 00	452 50
Forest Reserves Act.....	473 00	300 00	173 00
Dominion Parks Regulations.....	1,592 56	118 00	1,474 56
	3,075 46	468 00	2,607 46

STATEMENT H Dominion Lands Revenue for the fiscal year 1922-23 credited to Subsidy Account

Railway Company	Date of Order in Council	Gross Revenue	Refunds	Net Revenue
		\$ cts	\$ cts	\$ cts
Lake Manitoba Railway and Canal Co., Canadian Northern Railway System.....	Dec. 5, 1903..	1,600 00	10 00	1,590 00

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STATEMENT I—Cash Receipts on Account of Dominion Lands Revenue for the
fiscal year 1922-23

Source of Revenue	Gross Receipts		Refunds	Net Revenue	
	\$	cts.		\$	cts.
Homestead fees.....	53,460	00	270 00	53,190	00
Sale fees.....	80	00		80	00
Improvements.....	36,847	94	25,810 82	11,037	12
Sales of land.....	414,278	96	6,112 00	408,166	96
Timber dues.....	825,465	05	19,070 24	806,394	81
Grazing rent and hay dues.....	175,415	54	5,580 81	169,834	73
Export tax on gold, coal, petroleum, mining fees, etc.....	801,465	07	12,176 53	789,288	54
Map sales, rentals, office fees and miscellaneous.....	42,705	59	14,028 16	28,677	43
Liquor permit fees, traders' and trappers' licenses.....	5,844	40	24 00	5,820	40
Canadian National Parks.....	75,304	59	79 15	75,225	44
	2,430,867	14	83,151 71	2,347,715	43

STATEMENT J—Gross Receipts (Cash and Scrip) on account of Dominion Lands
Revenue compared with the previous fiscal year

Particulars	1922-1923		1921-1922		Increase		Decrease		Net decrease	
	\$	cts.	\$	cts.	\$	cts.	\$	cts.	\$	cts.
Dominion Land Agencies.....	517,983	82	911,265	92			393,282	10		
Crown Timber Agencies.....	1,004,217	97	861,982	98	142,234	99				
Mining Agencies.....	710,915	70	851,971	18			141,055	48		
Canadian National Parks.....	75,304	59	74,302	68	1,001	91				
Northwest Territories..	26,799	50	121,824	73			35,025	23		
Yukon Territory.....	96,545	56	97,182	10			636	54		
	2,431,767	14	2,918,529	59	143,236	90	629,999	35	486,762	45

PART II

CANADIAN NATIONAL PARKS

REPORT OF THE COMMISSIONER, J. B. HARKIN

The most notable event in the fiscal year 1922-23 in connection with National Parks was the completion of the Banff-Windermere Highway. This highway traverses the central portion of the main Rockies and connects Alberta and British Columbia by auto road. It is not only the first motor road across the central Rockies but it is also the last link in the great 6,000 mile system of highways known as the "Grand Circle Tour", which furnishes what is probably the most spectacular motor route in the world. For the past two years motorists in both countries have been eagerly awaiting the completion of this final arc. Now the circle is complete and motorists from the prairies may travel west from Calgary, Alberta, passing through the Banff national park and the magnificent alpine scenery of the central Rockies, touching Banff, lake Louise, the valley of the Ten Peaks, Moraine lake, across the Vermilion summit and through Kootenay national park to Invermere, B.C. From this point direct road connections can be made via Cranbrook, B.C., to Spokane and Seattle, Wash., Vancouver and Victoria, B.C., Portland, Ore., San Francisco, and Los Angeles, Cal. Returning the road swings east to the Grand Canyon, thence north via Salt Lake City, Yellowstone and Glacier national parks to the International Boundary and thence to Macleod and Calgary. From Macleod a diversion of 35 miles gives access to Waterton Lakes national park, the beautiful reservation in southern Alberta, noted for its fine scenery and unequalled fishing. The western section of the Grand Circle is known as the "California-Banff Bee Line", the eastern, the "Grand Canyon Route." With their extensions these roads make up a great international park-to-park highway system which touches twelve national parks in the United States and three in Canada.

Within Canadian territory there is also a smaller circle—the noose in this great scenic loop—which is known as the "Canadian Rockies Circle Tour." This is formed by the Transprovincial highway over the Crowsnest pass, which connects with the California-Banff Bee Line at Cranbrook and with the Grand Canyon route at Macleod, completing the circle of 600 miles, throughout every mile of which the motorist is either within or in full sight of the Rockies.

About 1911 the project was first formulated and the matter brought to the attention of the Provincial and Dominion Governments. Preliminary surveys were undertaken and Sir James Hector's observations with regard to the feasibility of the Vermilion route were recalled. Engineers of the British Columbia Government reported that this route offered the most favourable way of travel for a main motor highway through the Rocky mountains and that for scenic grandeur and location it could not be surpassed.

As a result of conferences between the two provinces of British Columbia and Alberta and the Dominion Government it was agreed that the province of Alberta should build the section from Calgary to the eastern boundary of Banff

national park, the province of British Columbia the section from the Windermere valley to the Vermilion summit on the western boundary of the park, and that the Dominion should build the section through the national park uniting the other two.

In 1914 the road was open from Calgary to the Great Divide and the Government of British Columbia had constructed about twelve miles on the western section, work being carried on from both ends of the road. Owing to the outbreak of the war the progress of the work in British Columbia was unavoidably interrupted and in 1919 a new agreement was entered into by which the Dominion Government undertook to complete the remaining 53 miles of road by January, 1924. In return the province of British Columbia agreed to convey to the Dominion an area of approximately 600 square miles traversed by the new highway, for national park purposes, an area now known as Kootenay national park.

The construction of a highway through unsurveyed mountainous country and so far from a base of supplies was attended with many difficulties. Railheads at either end were seventy-three miles apart and heavy snowfall during the winter months considerably aggravated natural disabilities. In spite of this, however, construction was carried on almost without interruption from the time of commencement and the road was completed by the autumn of 1922 or more than a year before the date fixed upon by the agreement.

Construction of the Vermilion-Windermere section presented many difficulties not only on account of the mountainous character of the country but owing to the long distances from railhead. From the crest of the Rockies, which the road crosses via the Vermilion pass, the road drops down the abrupt western slope of the Rocky Mountain range proper and then again ascends to cross the Brisco range, descending to the floor of Sinclair valley and through the thrilling Sinclair canyon to the Columbia. Forty miles of the road had to be cut through virgin timber, fourteen bridges had to be constructed and the road finally carved through the huge walls of the Sinclair canyon.

The railheads, Castle (Alberta) and Firlands, (British Columbia) were 73 miles apart. This meant that supplies for the central portion had to be transported by trucks or wagons over great distances. During the winter of 1920-21 the snow sometimes lay as deep as four or five feet on the passes and it often took days for the supply teams to reach the end of the road. About 60 miles of "tote" road were kept open during the past two winters.

Every mile of the new highway has been laid out so as to afford the motorist the finest views of the incomparable scenery as well as the easiest grades. The region is practically virgin country and it embraces some of the most magnificent scenery in the Rockies. The route is one that has been followed in the past by several pathfinders, chief of whom was Sir James Hector, geologist with the Palliser Expedition, who ascended the Vermilion on the famous journey which later resulted in his fortunate discovery of the Kicking Horse pass. The region is in fact so new that very few of the peaks bear names and fewer have as yet been ascended. A new world, rich in virgin attractions, is therefore opened both to the mountaineer and the motorist. The district abounds naturally in big game which is increasing rapidly and becoming very tame under the sanctuary conditions prevailing in the national parks. Wild goat, elk, moose, deer, and bear will all come within sight of the passing motor and a friendly Bighorn sheep will often dispute the right of way.

The road is to be formally opened on June 30 when representative speakers and visitors from the Dominion Government and from the provinces and neighbouring states are expected to be present.

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TIMBER PROTECTION

The fire damage in the parks during the year has been comparatively light. Although the weather was dry and dangerous and great fires raged in different parts of the country, the fires within the parks' boundaries, with one exception in Kootenay park, were all reached and controlled before serious damage was done.

FIRES IN THE CANADIAN NATIONAL PARKS

	1922-23	1921-22
Timber burned.....	298 $\frac{1}{2}$ ac.	2,614 $\frac{1}{2}$ ac.
Grass burned.....	11 $\frac{1}{2}$ "	1,615 $\frac{1}{2}$ "
Cost of extinguishing.....	\$3,000.00	\$8,200.00
Number of fires.....	70	70

The constructive programme of organization and preparedness for fire protection was continued throughout the building season with the following results: Nine new wardens' cabins were built, one partly built, one reconstructed and one taken over from the Royal Canadian Mounted Police, seven repaired or added to, and three stables erected. New trails totalling 61 miles in length were built giving easy access to much heretofore difficult country. Sixty-seven miles of forest telephone lines were strung which will add materially to the fire protection service.

In Waterton Lakes park the air patrols from High River made daily tours over the park and in Kootenay and Rocky Mountains parks an inspection and a selection were made for an aerodrome site and a number of landing places chosen for the proposed air patrols in these two parks.

Intensive training and examinations of the wardens of Jasper, Yoho, Waterton, Glacier, and Mount Revelstoke parks in the mechanical systems of fire-fighting were held. The fireguards in the prairie parks, Elk Island and Buffalo parks, were ploughed or harrowed as was necessary.

In Rocky Mountains park a new device was introduced by installing two large wooden tanks on Sulphur mountain which will act as reservoirs for water during the dry seasons, collecting and storing a supply from small rills which would not otherwise provide enough for pumps. Five portable pumps, with sufficient hose, were added to equipment during the year. A trial was made of another model high pressure pump which resulted in the purchase of one of these at the time and eight more were ordered for the 1923 season. A number of canvas tanks for the relay system and of military pack saddles were obtained and found very satisfactory in service.

For the year the wardens have travelled 217,770 miles on patrol.

TOWN PLANNING

Building plans in the various parks are now submitted to the architect of the Town Planning division and of those submitted during the past year in the majority of cases improvements were suggested and in many cases entirely new drawings prepared with a view to establishing more suitable and effective architecture in the various social settlements. In the course of time it is believed that this attention will greatly improve the appearance of the villages and towns from a modern town planning point of view.

New motor camping grounds were laid out at Banff covering 277 lots. Designs for nineteen shelters and two service buildings and a caretaker's lodge were supplied for buildings of log construction intended to harmonize with the parks environment and these have been erected. A new subdivision was laid out at Radium Hot Springs on the Banff-Windermere road and plans were

made for the entrance archway buildings at this point. These buildings now in course of construction will contain, on one side of the archway, quarters for the warden and on the other side a rest room for visitors. Plans for a new subdivision at Marble canyon were made, for the improvement of Banff avenue and a comprehensive town plan for Canmore mining village with a view to the beginning of a model mining village movement within the parks. This involved studies of existing buildings, ownerships, improvement in appearance, arrangement and locations.

Studies were made with a view to future artistic development at lac Beauvert, Maligne canyon, Miette hot springs, Elk Island park, Brereton lake, Nora lake, Waterton lakes, forts Chambly and Lennox, and Vidal's point.

Tentative plans were made showing possible locations for national parks in the Maritime Provinces and in the Gatineau district of Quebec and sketch plans for standards for historic sites. Plans were made for a summer colony at lake Edith, Jasper park. Reports and plans were prepared on Fort George, Garrison Reserve and Fort Missassagua on the Niagara front, after visits paid to the sites by the town planning adviser.

Educational work was carried on in the shape of press articles on town planning matters and correspondence with various groups in different parts of Canada with a view towards the establishment of local town planning organizations; lectures were given at different universities, towns and cities, and at Muskoka Assembly by members of the staff; and lantern lectures were issued to country societies and schools. Material was prepared for the *Town Planning Journal* and the *Town Planning Institute of Canada*.

Exhibits of town planning material were sent to the annual town planning conference in Ottawa and to a town planning conference in London, England.

ANIMAL LIFE AND FARMING OPERATIONS

Owing to the sanctuary afforded, all wild life in the various parks continues to thrive and multiply. In view of the decrease and extermination of the larger game mammals throughout most of the American continent this fact is very encouraging.

Buffalo.—A census of the buffalo herd taken on March 21, 1923, resulted as follows: Buffalo park, 6,780; Elk Island park, 281; Rocky Mountains park, 16; total, 7,077. The census for March 21, 1922, was 6,315. This shows an increase for the year of 762. The increase would have been larger but for the fact that 366 were slaughtered, died through natural causes or were otherwise disposed of during the year. In Buffalo park at Wainwright the buffalo have outgrown the capacity of the park owing to a succession of dry years and natural increase amounting from 1,000 to 1,500 annually. It was found that extensive feeding operations were necessary during the winter months and for this reason the department arranged for the slaughter of 250 of the older buffalo bulls, as an experiment. The products from these animals, consisting of meat, heads and robes, are being placed on the market. Owing to the fact that only old males were killed it was considered that the meat could best be utilized as pemmican. The department arranged for the manufacture of this meat according to the original Indian recipe. The work is being carried on under the supervision of a park official who is familiar with the manufacture of pemmican and who is being assisted in this work by a number of Indians. From the samples obtained and a number of reports from old-timers and people who have used pemmican it has been found that the quality is equal to that of the original product. It is expected that this food will be of great benefit and

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service in the outlying parts of Canada. Already extensive orders have been received from northern Canada.

Numerous requests for donation and loan of animals were received from zoological gardens from all parts of the world, particularly from cities in Canada, United States, Ireland, and Scotland. To show a spirit of co-operation in the conservation of wild life, these requests were complied with whenever possible. All expenses in connection with these transactions are borne by the consignees. Three elk were donated to the Penticton district of the Okanagan valley for the propagation of the species in that district. A number of mounted heads of buffalo, moose, elk, Rocky Mountain sheep, and goat were loaned for exhibition purposes.

Antelope.—The antelope herd in Nemiskam reserve continues to thrive and there are now 130 in the reserve, an increase of 30 during the past year. This appears to demonstrate that antelope can be successfully bred in semi-captivity. An endeavour is being made to capture another herd of antelope and transfer the animals to Nemiskam reserve. The creation of another reserve, or reserves, for these animals is now receiving attention. The present immediate necessity for this is occasioned by the fact that notwithstanding the protective measures now used, the animals outside Nemiskam reserve are being killed, and that the small scattered wild herds now remaining will soon be wiped out if still further measures are not taken for their protection. During the past winter provision was made for the purchase of fodder for a band of these animals, which it was reported were likely to die from starvation due to their inability to gather food owing to the depth of the snow.

Wolves.—Investigations in connection with the wolf menace have been carried on and taken up with the provincial authorities. It was thought that to combat the menace successfully the provincial and federal authorities should co-operate.

The question has been discussed with the provincial authorities but a definite working basis has not yet been defined.

Twelve persons were appointed temporary honorary park wardens to pursue wolves into Waterton Lakes park, which, it has been reported, have been molesting stock.

Bears.—A polar bear ten months old was secured for the Zoo at Banff. This bear was obtained at Chesterfield inlet by Sgt. Douglas of the Royal Canadian Mounted Police.

Fishing.—No change was made in the regulations during the past year. A few lakes where excessive fishing had been carried on were closed to give the fish a chance to increase. On the whole fishing was reported as being quite satisfactory throughout the different parks.

In Jasper park a number of lakes do not contain fish. Special investigation is being carried on with a view to stocking these lakes, which will be a great benefit to the park from a tourist point of view.

Permits.—Permits to collect a stated number of birds and mammals in some of the parks, for scientific purposes, were issued during the year to four naturalists of recognized standing.

Experiments.—Sunflowers for buffalo food were sown for experimental purposes in Buffalo park last year. The animals, particularly the buffalo, took to the food very readily and it was apparently relished. A larger area will be sown this year.

Buffalo wool has been sent out to manufacturers for experimental purposes. More wool is being gathered for this purpose. Final reports have not as yet been received.

The superintendent at Buffalo park reports progress in experimental cross-breeding now being carried on in that park by the Department of Agriculture. During the month of April, 1923, one of the domestic cows gave birth to a hybrid heifer calf from the buffalo bull, and two others had heifer calves from the young yak bull. All are doing nicely and are fine healthy specimens.

Revenue from Farming Operations

\$ 779 bushels oats threshed at 40 cents	\$ 3,511 00
1,610 tons hay at \$16 per ton	25,760 00
175 tons straw at \$5 per ton	875 00
26 tons green fodder at \$33 per ton	858 00
Total	\$31,004 60

PUBLICITY

In view of the opening of the first motor road across the central Rockies a special campaign of publicity was inaugurated early in the present year and 25,000 copies of an attractive illustrated brochure were distributed to motor clubs and similar organizations. This booklet contains the history and geography of the Banff-Windermere road, noting the main features of tourist interest. Through the co-operation of the Department of Immigration and Colonization, the Canadian Immigration officers in the United States assisted largely in the distribution of the work and of suitable maps. The Canadian Trade Commissioner in New York, Mr. Frederick Hudd, assisted in special publicity work in that city and arranged for the distribution of a large number of the pamphlets and also for the issue of special publicity items and magazine articles in connection with the opening of the road. About 2,000 copies were sent to the Canadian Pacific Railway Company, at their request, for distribution at their offices and a similar number to the president of the Calgary Good Roads Association which is undertaking on its own behalf a special campaign in connection with the new highway. It was found necessary to prepare a new issue of 15,000 copies.

Through the co-operation of the Department of Immigration and Colonization large pictures of scenes in the parks were framed and sent to sixteen of the Canadian Immigration agents in the western states. Six of these were sent to each office with instructions to forward them to the next office after two weeks. This will insure a circuit of distribution of 96 different pictures in the respective offices.

An exhibition of enlarged views of scenes in the Canadian national parks, particularly along the new highway, was held in the Railway Committee room of the House of Commons, which was viewed by about 260 members and senators. By arrangement with the Exhibition branch enlarged pictures of scenes in the parks were also supplied to any members who applied for them for use in their rooms in the House of Commons.

Requests for "Through the Heart of the Rockies and Selkirks" continue to come in steadily and several hundred letters of appreciation have been received. A special distribution of this booklet was made through the office of the Canadian Immigration service throughout Great Britain and the Continent. Copies were also sent to the principal clubs throughout the United Kingdom and to a number on the European continent. This booklet is now almost exhausted and a new edition may be necessary for the coming year.

A small folder entitle "What to Do at Banff" was also published giving concise information with regard to roads and trails and points of interest for visitors to Banff, lake Louise and the Field district. This publication is

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intended for distribution within the park and the greater part of the issue was forwarded to the superintendent for such distribution. Altogether about 50,000 pamphlets were distributed and a large number of prints and slides were circulated.

The official lecturer continued his public lecture work in Ontario and Quebec and during the autumn of 1922 visited the western provinces where he addressed a large number of educational institutions and clubs of various kinds. In addition the branch furnished twenty-nine lectures accompanied by suitable slides. Moving picture films were loaned to different organizations.

A monthly news bulletin was inaugurated early in the year and distributed in English and French to newspapers all over the Dominion.

REVENUE

The total revenue for 1922-23 was \$77,112.95, a decrease of \$2,102.21 as compared with the previous year. This is due to the fact that the branch collected in 1921-22 \$2,877 for Northwest game licenses which were issued last year by the North West Territories Branch.

ROCKY MOUNTAINS PARK

Tourist Traffic.—The tourist figures for Rocky Mountains park were very satisfactory. The following is a summarized statement:—

Hotel	Home Country of Visitors				Total
	Canada	United States	Other Countries	Conducted Parties	
Banff Springs Hotel, Banff	2,639	12,608	963	252	16,462
Chateau Lake Louise, Lake Louise	1,877	17,525	1,001	883	21,286
King Edward Hotel, Banff	3,695	418	341		4,454
Mount Royal Hotel, Banff	1,359	1,177	503		3,039
Bretton Hall, Banff	2,191	604	100		2,895
Homestead Hotel, Banff	1,463	311	42		1,816
Alberta Hotel, Banff	983	203	14		1,200
Hot Springs Hotel, Banff	413	15	3		431
Totals	14,620	32,861	2,967	1,135	51,583

Summary

Total hotel registrations	51,583
Motorists	18,959
Campers	2,000
Roomers	1,700
Excursionists	5,500
Grand total	79,742

Government Baths.—There were approximately 5,000 more bathers accommodated at the Cave and Basin during the year than in any previous year. The total number was 49,077. At the Upper Springs the number registered totalled 21,476, which is a slight decrease from the record of the previous year due to the fact that during the last three months of the year there was a shortage of water at the springs and few bathers were admitted. The visitors came from such far distant parts as England, Scotland, Ireland, Australia, New Zealand, Italy, Russia, Africa, India, Channel Islands, as well as from the United States and all parts of Canada.

Motor Traffic.—The total number of motor licenses issued in Rocky Mountains park was 4,213, which is 721 more than last season and the total number of persons who entered the park by motor was 18,959. On 1st July, 281 licenses were issued, which is a record for any one day; 502 licenses were issued for the week ending July 31, which is a record for any one week and the total for the month of July was 1,518, which is again a record for any one month. The total number of cars from Calgary during the year was 2,761; other parts of Alberta, 129; other parts of Canada, 225; United States, 198. Twenty-nine different states were represented among the visitors.

Power Plant.—Owing to the closing down of the Bankhead mines, the Canadian Pacific Railway which owns the mines, notified the department that it would not be able to continue to supply Banff with electric light and power. Consequently the department had to take steps for the construction of an electric plant of its own. When the Calgary Power Company was given authority in 1911-12 to erect a dam at the outlet of lake Minnewanka and to use the lake as a storage basin provision was made in the contract that the Company must install a thimble in the dam to enable the department to use the natural flow of the Cascade river for power purposes. To meet the situation created by the closing of the Bankhead mines and the consequent need of a new source of electric power for Banff the department decided to take advantage of the power provision in the Calgary Power Company's contract. In December work on the necessary plant was commenced. The construction camps were erected, the pipe line surveyed and cleared and substantial progress made in the cutting of the necessary tunnel.

Government Town Sites.—A total length of 1,289 feet of new sewer was laid during the year and 1,933 feet was replaced. A fill of 15,000 cubic yards to finish the approaches to the new Bow bridge was undertaken in the spring and the approaches to the bridge were surfaced, foot paths constructed, and the gravity water system carried across the bridge. Periodical inspections by the sanitary inspector were made during the year of all restaurants, laundries, dairies, etc. Numerous improvements were made at Canmore. The summer garbage collection was continued and the main street was scarified, surfaced and rolled. A new street lighting system was installed.

Camping ground.—The Rundle Mountain camping ground situated very charmingly at the junction of the Bow and Spray rivers has attracted visitors to an unprecedented extent. Increased facilities were provided for the campers in the way of telephone, caretaker, cooking stoves, etc. This camp was inaugurated six years ago and the number of permits has risen from 73 to 527.

Golf Course.—All the bunkers, greens and fairways on the new golf course have been completed but the late spring retarded the normal growth of the turf. Owing to the fact that the course is situated at an altitude of 4,500 feet the average growing season is very short and night frosts are common.

Game.—A herd of elk from Yellowstone park, liberated in the park in 1920, has increased rapidly and small herds are now frequently seen on the motor roads in the vicinity of Canmore, Dutthill, Anthracite, and Massive. Rocky Mountain sheep are also increasing noticeably. They can be seen on the southern slopes of the Sawback range at any time in large numbers and small herds often frequent the motor roads on the Banff-Castle road. Certain portions of the sheep range are now occupied by goats which have chased the sheep from the range. This is sufficient evidence of the increase in their numbers. They will not graze with sheep. Beaver are also increasing rapidly. A small colony has established itself on the Bow river a short distance from the golf

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links. In carrying out the policy of keeping noxious animals under control, twenty-six coyotes, two wolverine, one mountain lion, and one lynx were destroyed during the year.

Trails.—The total length of trails now within the park is approximately 700 miles. During the summer months new trails were made from Stoney Creek summit to the mouth of the Dormer river, a distance of 17 miles; from Scotch camp on the Red Deer river to Indian Head on the Clearwater river, a distance of 15 miles; and from Spray lakes to the Kananaskis river, a distance of 12 miles.

Mosquito Control.—Mosquito control in the park areas is of the greatest importance since the advent of the mosquito coincides with the height of the tourist season. Mr. Hearle, of the Entomological Branch, Department of Agriculture, superintended this work during the season and the operations were very successful. Most of the work undertaken consists of spreading kerosene oil over the breeding places of mosquitoes. The oiling covered an area comprised within the four-mile radius of the Banff townsite and very few mosquitoes were observable during the season.

Zoo.—At no time in the history of the zoo has such interest been manifested by tourists as during the last season. At all times during the day large numbers are seen viewing the animals and at feeding time difficulty is experienced in getting near the cages. During the year the following additions were made to the collection: One Polar bear cub; one tame coyote; two brown pelicans; one silver groundhog; one peacock; two osprey hawks; six magpies. By far the most interesting of the newcomers is the Polar bear cub, which is a great favourite with the visitors.

Animal Enclosure.—The animal enclosure situated two miles east of Banff, on the Banff-Calgary highway continues to be a great attraction to the tourists. Thousands visit it every year and now that the motor car can be driven over a fairly good road completely round the buffalo paddock the number of visitors is greatly increased.

Building Permits.—During the year twenty-seven building permits were issued. The estimated cost of this work is \$69,675.

Fire Brigade.—The fire brigade was called out sixteen times and was successful in preventing any serious damage. The estimated total loss for the year was approximately \$295. The personnel of this brigade is composed of citizens who volunteer their services, while the equipment and hall are supplied and maintained by the department.

Walking Tours.—Walking tours were again conducted by Mr. Wheeler. These tours provide for persons of limited means facilities for passing through some of the most beautiful spots in the park.

Tuberculin Tests.—During the month of November the annual tuberculin tests were made of the various dairy herds in the park by the inspector of the Department of Agriculture, assisted by the local sanitary inspector. Two hundred and fifty head were tested and of these only four reactors were found. These were slaughtered. Careful supervision is maintained over all dairies and as a result the milk sold in the park is of a very high standard, both as to quality and cleanliness.

YOHO PARK

There was a considerable increase of visitors to the park compared with the previous year. This was largely due to the additional camps that have been constructed for tourist service. The Canadian Pacific Railway has erected

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camps at lake O'Hara and Summit lake, while the capacity of the Emerald Lake chalet has been more than doubled, as was also the capacity of the Yoho camp. These camps, as well as the Wapta camp and the Y.M.C.A. camp at Field were all filled to the limit throughout the season. Two special camping grounds were laid out by the department and permanent cooking stoves erected, which were much appreciated by the public and tended to decrease the danger from fires.

Among the considerable works undertaken during the year in Yoho park was the dismantling of the high trestle bridge at Ottertail which was successfully executed with a comparatively small loss of material. From this structure about 295,000 feet of timber was salvaged as well as several tons of bolts, nuts, washers, and truss rods. This stock of material has proved very valuable for all kinds of construction work and repairs.

In the spring a new bridge was built over the Kicking Horse river, about 14 miles west of Field, entirely from the Ottertail bridge material, and about 70,000 feet was used on the work. Late in the season other bridges were built over Sherbrooke creek, Emerald creek, and on the Yoho road near the 11 Mile post.

GLACIER PARK

At the Nakimu caves further exploration and development work was carried on in No. 4 cave. A total distance of 885 feet was made accessible to the public by the erection of stairways of concrete, walks and platforms. Shortly before closing down a new cave was discovered 430 feet long and 12 to 16 feet wide and approximately 100 feet high. The floor is composed of fine water-washed gravel. This is the largest cave so far discovered. It has been named "Grand Canyon".

The number of visitors to the caves was 660, by far the largest on record. Gasolene lanterns were used in place of carbide lights and the change was fully justified. The light is more brilliant and the lanterns are easy to keep clean and generally more convenient. The total number of visitors to the Glacier House was 3,792, an increase of 569 as compared with the previous year. Of these 289 were Canadians, 3,254 came from the United States, 111 from other countries, and 138 unlocated.

MOUNT REVELSTOKE PARK

During the summer of 1922 Mount Revelstoke park and the Revelstoke district as a whole were for the first time opened up to motor traffic from outside points by the completion of the provincial motor road to the Okanagan. An immediate increase of traffic followed on the completed part of the Mount Revelstoke highway, some of the visitors coming from as far away as southern California. The department continued the work on the section of the Mount Revelstoke auto road abandoned by the contractors, and completed the grading. A total of fourteen miles is now open on this road.

JASPER PARK

The past season has been by far the most interesting with the largest number of visitors in the history of Jasper park. This was due in large measure to the better facilities for visitors provided by the completion of the first unit of the Jasper Park Lodge built by the Canadian National Railways. This unit was ready for occupation on June 15. It provides excellent accommodation for 75 guests, with every modern convenience, such as electric light and hot and cold water. Further extensions to the Lodge are in progress which will supply accommodation for 300 persons and include a large central lounge and dining room.

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The harmonious and artistic type of architecture selected makes the Lodge a distinct attraction to the beautiful surroundings at Lac Beauvert.

Jasper park was again honoured with a Viceregal visit during the past year. Their Excellencies the Governor General and Lady Byng, and their house party, spent nearly three weeks in the park. The visit of the British parliamentary party was also an interesting event of the season.

Roads.—Speaking generally the development has been most satisfactory. As a part of a plan for the opening up of hitherto inaccessible areas in this very large park the outstanding feature has been the completion of nearly 13 miles of the Edith Cavell highway including the extensive switchback tangents from the Astoria river to the upper benches leading to the foot of mount Edith Cavell.

Wild Life.—The success of the experimental herd of wapiti has exceeded expectations. The surviving 85 from the 100 so kindly sent by the United States Government have now multiplied to 400. The largest herd have adopted the area around lakes Patricia and Pyramid as their range and more than 100 have been seen there at one time. Another large herd of more than 100 range at Buffalo prairie. More than 100 deer indigenous to the park, between 50 and 100 Rocky Mountain sheep and goats, besides some of the Douglas or large mountain caribou have been seen within an area of approximately 5 square miles of Buffalo prairie. As the Douglas caribou is believed to be gradually disappearing in the northern part of its range it is gratifying to know that this animal is found in Jasper park. It is estimated by the wardens that there are approximately 100 living within the park and that the number of animals is gradually increasing.

Moose are also increasing noticeably, owing doubtless to the sanctuary offered them in the park, since they have been much harassed by hunters in the old ranges outside the park boundaries. There has been a marked increase in the fur-bearing animals. Beaver, marten, fisher, and mink are flourishing everywhere. The beaver in particular are getting very numerous and wonderfully tame. Bears are increasing very rapidly, particularly black and cinnamon, in the Athabaska valley. Grizzly bears are very plentiful both in the Snake Indian and Rocky River valleys.

Among the game birds the prairie chicken show most manifest evidence of increase. They are migrating to the eastern portion of the park and raising large and healthy looking broods. Here, too, are signs that they are aware of sanctuary.

Fish.—The outstanding feature in connection with fish has been the success of the installation of ouananiche and Atlantic sea salmon in Pyramid lake. The best catches ever known were made during the past season.

Building Permits.—The value of building permits issued during the year was: Jasper townsite, \$13,300; Lac Beauvert, \$15,900; Brule, \$40,200; Lake Mildred, \$100; making a total of \$69,500. A boulder-and-concrete garage was erected for park service, also three standard cabins.

Reconnaissance.—The reconnaissance of the northwestern portion of the park, undertaken by the chief inspector, the supervising warden and a party of wardens accompanied by a government photographer supplied much needed data on topography, wild life and scenic features which hitherto had been unknown.

Golf Course.—Satisfactory progress was made in cutting and clearing the nine-hole golf course laid out immediately east of Lac Beauvert and in close proximity to the Lodge.

WATERTON LAKES PARK

The effect of the general economic depression has been felt in the decreased use of the park by local patrons. On the other hand foreign tourists are more in evidence and the wider advertisement which the park is receiving may be expected to reverse the record of this year in the immediate future.

The opening of the new subdivision has resulted in thirty-four applications for building leases and the erection of twenty houses. This has involved much work in the clearing and grading of streets.

The new entrance road of approximately $5\frac{1}{2}$ miles from Waterton bridge to the townsite was built and was in general use by August 1. An off-shoot of this road connecting with the new golf course was completed early and was in constant use by July 1. The gravelling of the Pincher Creek road was done in the fall. Great interest was evinced by visitors in the Akemina highway on which work was commenced in the winter of 1921-22. The great possibilities of this road are keenly appreciated since it will form, with other extensions, easy connection with the Banff-Windermere road and the United States park-to-park highway system. Considerable location work was done for new bridges and roads. The gasoline engine and saw-mill are proving very satisfactory in securing lumber for bridges and culverts and a considerable saving is thus effected.

Fifteen miles of new trails were constructed and the old trails improved. There are now 200 miles of trails in the park.

Twelve miles of new telephone line were completed from Belly River station to Lee creek. This makes 60 miles of single wire grounded telephone now in operation.

The game regulations are strictly enforced. The menace of wolves and coyotes was largely met by the issue of hunting permits to honorary wardens. Wild life is continually on the increase, notably the mule deer and the Rocky Mountain sheep. White tail deer, though not numerous, are still to be seen. Beaver are becoming very plentiful and are found all over the park. As usual thousands of duck and geese took advantage of the lakes as a resting place during their migration in the spring and fall. A number of wild swan were seen during May on Muskilonge lake.

Fishing has always been a noteworthy feature of the park. Fine specimens of salmon trout and Rocky Mountain white fish, pike and cut-throat are found. Waters hitherto without fish have now been stocked. Egg planting in September was a new experiment and the results are being closely watched. If successful, the cost of restocking will be greatly minimized and backwaters, now inaccessible to pack horses, will be easy to stock.

The Golf Course.—Work on the golf course continued during the season and although it is still in a rough condition it has served numerous players. The course has a wonderful scenic location.

Camping.—Camp life has always been a leading feature of this park, and there is evidence that it is becoming increasingly popular. Considerable work was done in the early season in preparing the ground and clearing further areas. Three concrete stoves were erected which were in constant use. A special feature of the season was the advent of the Boy Scouts under the direction of the Scouts' Commissioner of Cardston and the surrounding districts, comprising about fifteen troops. By this means 100 boys received training and an ideal holiday. This was followed by a party of fifty boys in charge of the Y.M.C.A. of Lethbridge. The suggestion was made that all local detachments at Lethbridge, Macleod, Pincher Creek, and Cardston should establish permanent summer camps in the park, the buildings to be erected by the boys as part of their training. The camping permits were slightly in excess of the previous year.

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Farming Operations.—The initial efforts of 1920, when farming operations were first undertaken, are now bearing fruit as may be seen from the production record: 106 tons of green feed and 105 tons of hay. These products obviate the purchase of forage and its transportation from various railway points. Seed sown last spring should give ample hay to cover the whole year.

BUFFALO PARK

There were approximately 550 acres in crop during the year in Buffalo park, all oats; 100 acres new breaking, 200 acres summer-fallow, and the remainder spring ploughing. About 50 acres were cut for green feed, and from the remainder 8,779 bushels were threshed, which, after shipping 800 bushels to other Dominion parks, was sufficient for the requirements of the coming year, including seed.

Very good results were obtained from an experiment in growing sunflowers, and the experiment of feeding sunflowers to the buffalo in winter was also satisfactory, as well as interesting. It is expected that in the future the feed situation may be greatly helped by growing sunflowers at different points in the park.

By installing temporary dams in the Ribstone creek in the early part of the season, dry portions of the meadow were flooded resulting in a wonderful yield of hay. Approximately 1,300 tons were cut on this meadow, all of which was needed before the winter was over, owing to the poor grazing conditions on the range.

Fourteen miles of fireguarding south of the ford on the west side of the park were ploughed by hired teams and about three miles of new guard at the southwest corner of the park. The remainder of the fireguard work, amounting to 170 miles, was done by park outfits.

About four miles of new fencing were erected during the year. About three miles of the cattalo fence were moved to provide better trails leading to winter quarters for the buffalo, and sixty miles of the main fence were repaired; also four miles of the low fence around the hay meadow.

Two new branch telephone lines connecting the buildings in the cattalo enclosure and those at the abattoir with the main line were constructed, as well as considerable repairs made to existing lines.

Dry wood permits covering 725 cords were issued to settlers living in the vicinity of the park during the year; also permits covering 6,000 green willow pickets were obtained by the settlers.

A garage and store-room were constructed at the farm, and, in addition to constructing a boarding camp and barn at the slaughtering plant in winter quarters, the first unit of the abattoir, to be completed during the coming year, was built. The installing of an electric light plant at the farm has not only been an improvement but also a protection from fire.

Wild Animals.—Considering the poor condition of the range last fall the animals have come through the winter better than was expected. There have been large increases in every herd again this year. The natural increase in buffalo has been 991, and although approximately 300 were slaughtered during the past winter the count this spring showed the number of buffalo in the park to be 6,780.

The records show that there are at present the following animals in the park: Buffalo, 6,780; moose, 28; elk, 218; mule deer (estimated), 1,000; antelope 4, cattalo, 13; yak, 20; domestic cattle (cattalo experiment), 15; hybrid yak, 2; total, 8,080.

A pair of buffalo were shipped to the Zoological Society of London, England, during the year.

Breeding Experiments.—Considerable progress has been made during the year in connection with the cross-breeding experiment which is being carried on by the Department of Agriculture in this park. In addition to the hybrid buffalo calves which arrived this spring, there are a number of calves from the yak-domestic cross, and the experiments so far are considered very satisfactory.

Visitors.—In September Their Excellencies the Governor General and Lady Byng, together with their party, visited Buffalo park. The various kinds of animals were rounded up for the occasion and the members of the party expressed great interest in the animals.

Entries in the registers kept show that 8,000 tourists visited Buffalo park during the year, most of these travelling by motor.

ELK ISLAND PARK

This year the Department took over 34 sections of the Cooking Lake forest reserve to be fenced and added to Elk Island park. This will extend the total area of the park to 32,000 acres and will much relieve the present overcrowding of animals and make room for the addition of a goodly number of elk, moose, and deer within the new enclosure. The land affords excellent pasturage with several small lakes.

With the arrival of spring the usual repairing and cleaning up of the grounds were undertaken. New seats, tables, stoves and a speakers' platform were placed in the picnic grounds and new seats along the lake shore. To improve bathing facilities reeds were cut along the lake shore and during this operation an attractive beach was discovered, which serves admirably as a safe bathing place for young children. The building up of the sports' grounds is proceeding, and it is already proving a great boon to the campers.

Three hundred and fifty tons of hay were cut on Goose Lake meadow and with other additions a crop was put up of 400 tons. Permits to cut a total of 97 tons were granted to farmers living in the vicinity of the new park area.

The fireguard around the park was ploughed in July and October. There were no fires in the park, though one on the forest reserve close to Goose Lake hay meadow gave considerable anxiety. The staff were at hand night and day and no damage was done to the park. All the fences were repaired and 23 carloads of new posts were placed at convenient points for hauling to the fence site of the new park area.

Mammals and Birds.—The animals came through the winter in satisfactory condition. There was, however, a decrease of 15 in the number of buffalo. Thirteen of these were slaughtered and two were found dead. One crippled moose cow was shot and an aged bull moose died. The records show the number of animals as follows: Buffalo, 292; elk, 189; moose, 77; mule deer (estimated), 155. The coyotes are very plentiful in the park and owing to the heavy brush it is difficult to hunt them with dogs. By trapping and shooting seventeen of their number were destroyed.

The blue heron and turkey buzzard return each year and nest on the islands. Partridges, prairie chickens and ducks are almost innumerable. This year the ducks enjoyed the protection of the park until December 7, and while the ice was a foot thick elsewhere on the lake they still had a hole open for their operations.

Visitors.—The total number of visitors to the park for the year was 5,605 as compared with 5,443 last year.

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POINT PELEE PARK, ONTARIO

Point Pelee national park extends from the mainland, in Essex county, Ontario, eight miles south into lake Erie and is the most southerly point of Canada. It is only within the last decade that its exceptionally mild climate and great beauty have been adequately realized, both as a holiday resort and as a bird paradise. Motor roads now exist that give access to the many attractions of the park and each year they are being extensively used.

During the past year extensive stretches of road-grading and cutting of abrupt angles have been carried out, together with moulding of road-beds and surfacing with a suitable depth of clay. The native soil is composed principally of sand and requires clay as a binding material. This clay has to be hauled from a point considerably north of the park boundary. In the northern division of the park surfacing of the roads has been completed, except the refilling necessitated by motor traffic during the period of construction.

The early spring season permitted the planting of a number of willows on the shore in good time in proximity to the new bathhouse. The walnut trees planted the previous year have done very well. A number of the southern cacti beds have been enclosed in barricades built of rustic work which protect them from injury. The luxuriance of these plants is always of great interest to visitors and is evidence of the mildness of the climate.

The construction in the northern portion of the park of a modern bathhouse and pavilion has materially added to the convenience of visitors. Driven wells have been installed in this section of the park and camping stoves have been placed there for cooking purposes. At the southern point of the park signs have been erected warning bathers of the dangerous currents which make bathing risky to the uninstructed.

Bird houses have been constructed in suitable places. The usual migrants visited the park and several species of the smaller songsters remained until late in December. Cottontail rabbits have become a nuisance and steps are being taken to reduce their number. Muskrats have increased. The quail have multiplied and the ring-necked pheasants are holding their own and are strikingly attractive to observers.

The number of visitors to the park was distinctly in advance of the year, 1921. The estimate for that year was 7,000 while the estimate for 1922 may be placed at 12,000. Motor traffic has nearly doubled in volume.

FORT ANNE PARK, NOVA SCOTIA

It is estimated that more than 10,000 persons visited Fort Anne during the year 1922, 5,026 of whom registered in the administration building and received personal attention, while the rest contented themselves with inspection of the fort and the grounds. There are now six rooms and two corridors of the administration building—the old officers' quarters of the fort—furnished as a museum, and an "Acadian Room" is in course of preparation. It is also intended to furnish one of the rooms after the style of two centuries ago when they were occupied by officers of the garrison.

An interesting addition to the museum is a facsimile of General Monckton's commission "As Lieutenant-Governor of the Garrison of Annapolis Royal in America," signed by George III in the first year of his reign. This is the gift of Sir Frederick Williams-Taylor, who is owner of the original document.

The most interesting event of the year was the return of the key of the fort by the Massachusetts Historical Society, an act of great courtesy and generosity on the part of the society, which has had possession of the key since 1786. Upon the surrender of the fort by the last French general in 1710,

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the key was taken to Boston by General Nicholson and passed to the possession of the Belknap family who handed it over to the Massachusetts Historical Society in 1786. Three prominent members of the society visited the fort on September 18 and formally returned the key as a gift to the Canadian nation.

The administration building has been repaired and re-roofed and much improved in appearance. The fort continues each year to attract more visitors and students of Canadian history.

ST. LAWRENCE ISLANDS PARKS, ONTARIO

The thirteen island national parks and one mainland reservation among the Thousand Islands of the St. Lawrence between Morrisburg and Gananoque have been largely utilized by campers and picnickers and they have continued to provide inexpensive and wholesome holiday facilities for the Canadian people in that part of the Dominion. Boy scouts, girl guides, school parties and similar organizations have now found it necessary to apply for camping permits well in advance of the season in view of the large demand for camping privileges. The parks are provided with stoves, pavilions, and other conveniences.

PROTECTION OF MIGRATORY BIRDS

The end of the fiscal year 1922-23 finds the Migratory Birds Convention Act in the sixth year of its enforcement and the marked increase in valuable forms of bird life, noticeable almost from the inception of the Act, is a matter for congratulation. This is particularly so as regards waterfowl. Reports show that a notable increase in numbers is apparent among these birds in all parts of the Dominion, except that a scarcity of brant and eider was noticeable along the Atlantic coast and in the gulf of the St. Lawrence, during the summer and autumn of 1922. This scarcity was probably due, in the case of brant, to a poor breeding season for this species, and in the case of eider to the invasion of the islands and the north shore of the gulf of St. Lawrence by a large number of white foxes which came down from the north in the early spring.

In July, 1922, the regulations under the Migratory Birds Convention Act were amended, the principal changes being adjustments of the open seasons in the different provinces, the inclusion of Alberta among the provinces, in which the sale of migratory game birds is prohibited at all times, the adjustment of bag limits, the alteration of the hours for shooting in Ontario, and the inclusion of a clause making the possession of night lights and firearms in places frequented by migratory game birds *prima facie* evidence of night shooting.

Special seasonal local conditions created the necessity for the appointment of four full-time temporary bird officers in the Maritime Provinces, during 1922. In March, 1923, one officer resigned from the permanent organization for the enforcement of the Migratory Birds Convention Act. With the exception of these cases the permanent staff of officers is unchanged. The appointment of 118 honorary officers was completed during the year, while 5 resigned. This leaves the present strength of the honorary officers at 318 including fishery and forestry officers co-operating, distributed as follows:—Prince Edward Island, 2; Nova Scotia, 54; New Brunswick, 38; Quebec, 32; Ontario, 65; Manitoba, 11; Saskatchewan, 19; Alberta, 37; British Columbia, 49; Yukon Territory, 1; Northwest Territories, 10.

In addition, the members of the Royal Canadian Mounted Police, to the number of 1,129 officers and men, make a total of 1,447 honorary officers operating under the Act.

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The number of prosecutions instituted by officers of the branch, during 1922-23, was 36, as against 86 cases during the fiscal year 1921-22. The large falling off in the number of violations occurring is, no doubt, largely due to the better understanding by the public at large, of the need of, and the benefits to be derived from, a greater measure of co-operation in the observance of the provisions of the Act.

Of the 36 charges laid, convictions were secured in 23 cases, fines being imposed totalling \$310, four cases were dismissed and nine charges were withdrawn, while three shot-guns, one revolver and two bird specimens were ordered forfeited to the Crown by the presiding magistrates.

During the summer of 1922 Mr. H. F. Lewis and three assistants spent three months on the Canadian Labrador investigating bird conditions there.

One hundred and seventy-three permits were issued during the year allowing the holders to take birds for scientific purposes, and 44 permits allowing the capturing of protected birds for banding purposes. Propagating permits to the number of 244 were issued, of which 23 were permits allowing the taking of protected birds, and 221 were permits to possess protected birds.

Permits to take migratory birds for propagating purposes, also allow the holders to possess, sell and transport such birds to another holder of a permit for propagating purposes, but in no case shall birds so taken be killed.

Permits to possess migratory birds for propagating purposes, also allow the killing of such birds in any manner except by shooting, and the unplucked carcasses or the plucked carcasses with heads attached, may be sold and transported except that birds taken under the first mentioned permit shall not be killed.

Additional restrictions affecting permits for propagating purposes have been imposed at the request of the different provincial governments as follows: Of the 23 permits allowing the taking of migratory birds, one, issued to a resident of British Columbia, does not permit the transportation of any birds taken under this permit; and one permit, issued to a resident of Alberta, does not allow the sale of any migratory birds taken under it. Of the 221 permits issued allowing the possession of migratory birds, five, issued to residents of Alberta, do not allow the sale of any birds possessed; 93, issued to residents of Ontario, do not allow the killing of any birds possessed; while nine, issued to residents of British Columbia, do not allow buying, selling, transportation, or killing of migratory birds possessed under permit.

During the year it was decided that a record of all birds banded in Canada should be kept by this branch and satisfactory arrangements were made with the Biological Survey at Washington, whereby this plan could be carried out.

Complete records of all birds banded in Canada and the United States have been kept at Washington for a number of years, and to avoid confusion only one set of band numbers is in use on the continent. These numbers are allotted and the bands are supplied to holders of banding permits by the Biological Survey.

Records of birds banded in Canada have been forwarded, by the banders, direct to Washington in the past, but under the new arrangements all holders of banding permits in Canada will submit their records to Ottawa, where copies will be prepared, after which the original records will be forwarded to Washington by this branch.

Since the inception of this plan 1,707 birds have been banded by Canadian bird banders, and records have been received of 118 returns of birds previously banded.

It is believed that much valuable information concerning bird migration will be collected in these records and it is proposed to publish in the *Canadian*

Field Naturalist lists of birds banded in Canada wherever retaken and lists of banded birds taken in Canada wherever banded, so that all students of ornithology may have access to them.

Fifty-nine taxidermists' licenses were issued during the year, bringing in a revenue of \$59.

A round table conference of federal and provincial game officials was held in Ottawa on December 6, 7 and 8, 1922, under the auspices of the Canadian National Parks. All the provinces and territories, with the exceptions of British Columbia and Prince Edward Island, were represented at this conference, and a few other persons interested in the protection of birds and mammals attended. The proceedings of the conference were marked by a splendid spirit of co-operation, and all the resolutions adopted were adopted unanimously.

The resolutions dealt with many important matters, such as, a Dominion-wide educational campaign in the interest of wild life conservation; general prohibition of the sale of game; uniform adjustment of the bag limit for Canada and the United States; federal assistance for the provinces in controlling illegal shipment of game and fur; a gun license system for all hunting; alteration of present open and closed seasons for several species of birds; and protection of marine mammals.

The problem of controlling the wolf and coyote menace in the West was thoroughly discussed. The opinions of those taking part in the discussion were frequently at variance, but many helpful suggestions and interesting points were submitted.

It was obvious at the conference that both the provinces and the Dominion realize their distinct responsibilities in the matter of the guardianship and development of Canada's wild life resources, and that with intelligent conservation and utilization there is no reason why this natural asset should not be preserved and constitute a perpetual source of profit. It was felt that conditions in other countries, at least in so far as big game is concerned, are such that Canada is destined soon to enjoy a practical monopoly on this continent.

This branch was represented at the meeting of the International Association of Game and Fish Commissioners, held at Madison, Wisconsin, in September, 1922, and at the meeting of the American Game Protective Society, New York.

Many inspections were made during the year of areas recommended for reservation as bird sanctuaries and as a result action is being taken in connection with the establishment of sanctuaries on either Crown lands or privately owned lands in every province in the Dominion.

The need of public shooting grounds is becoming increasingly apparent and in this connection a number of areas have been recommended for this purpose. During the summer of 1922 inspections were made of numerous areas in Saskatchewan and Alberta and search is being made in the other provinces for vacant Crown lands suitable for this purpose.

That education is an important factor in wild life protection is fully appreciated by this branch and during the year 1922-23 posters, setting forth the provisions of the regulations under the Migratory Birds Convention Act, as applicable to whites and Indians, the restrictions against spring shooting, the molestation of swans and whooping cranes, were distributed to the number of 19,252.

Through the courtesy of the Post Office Department, the Canadian Pacific and the Canadian National Railways, posters, regarding the provisions of the regulations under the Migratory Birds Convention Act, were displayed at every railway station and post office in the Dominion.

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Eighty-nine thousand two hundred and fifty (89,250) pamphlets on bird protection matters were distributed during the year, and in this connection it may be noted that the demand for the pamphlets "Bird Houses and Their Occupants" and "Bird Lessons" is so great that a reprint of 180,000 of the former was obtained in the autumn of 1922, and a reprint of 80,000 of the latter is now being prepared.

An order has recently been placed for the printing of 60,000 copies of a companion pamphlet to "Bird Houses and Their Occupants" entitled "Attracting Birds with Food and Water," and 12,000 copies of a pamphlet entitled "Facts about the Migratory Bird Treaty."

The members of the permanent staff gave 114 lectures during the year, most of which were illustrated by lantern slides. Motion picture films were also shown in many cases.

The library of lantern slides has been materially increased, 150 sets having recently been added. It now comprises 539 sets of slides covering 176 different species of birds. There are also in course of preparation some 230 sets from negatives loaned by the Department of Mines or from negatives, the right of reproduction of which has been purchased. Nine hundred and forty-one (941) slides were loaned to various bird protection societies, church societies, etc., during the last twelve months.

To encourage an interest in wild life protection matters among the boys of the Dominion, an arrangement was made whereby any boy scout passing the scout's naturalist test would receive a copy of "The Conservation of the Wild Life of Canada," by Dr. Gordon Hewitt. Up to the end of the fiscal year 414 of these books had been awarded.

HISTORIC AND PREHISTORIC SITES

Although the work of marking and preserving historic sites has only been in operation a short time satisfactory progress has been made.

Of the 700 sites to which the attention of the department has been called about 100 have been judged by the Historic Sites and Monuments Board to be of national importance and of these 27 have been acquired by patent and the virtual control of 14 others secured. Upon examination it was ascertained that six of these sites are already suitably marked and therefore require no further action at present. Ready co-operation is being accorded by provincial and local societies and organizations interested in the work.

Sixteen standard bronze tablets have been secured which it is proposed to erect on cairns constructed of rough field stone or large boulders.

An extended publicity campaign has been carried out through the press and the departmental bulletin in connection with sites selected for action in an endeavour to stimulate public interest regarding the early history of Canada.

The last report reviewed the steps taken with regard to sites selected for immediate attention. The following schedule contains a précis of additional action taken this year.

Maritime Provinces

Louisbourg, N.S.—Revised descriptions of the various properties included in the site were secured through the Department of Railways and Canals. An area of sixty-eight acres owned by that department has been leased to this department for memorial purposes.

Fort Cumberland, about four miles from Amherst, N.S.—Area five acres. Material for a fence was purchased and its erection partially completed.

Fort Edward, Windsor, N.S.—Area twenty-seven acres, on which are situated original blockhouse and ruins of officers' quarters. Blockhouse painted and matter of possible encroachment on property investigated.

Quebec

Fort Chambly, Chambly, P.Q.—Considerable progress has been made in connection with repair work on the exterior and interior of the massive stone walls to prevent further deterioration. A new roof was placed on the caretaker's quarters, and a fence around the cemetery. A collection of rare books, photographs and relics was added to the museum. The fort was visited by over six thousand people.

Fort Lennox, Ile-aux-Noix, P.Q.—Since the transfer of the site from the Department of Militia and Defence on May 18, 1921, considerable progress has been made in regard to the preservation of the old fort and general improvements have also been carried out on the island to make it attractive to tourists. These include the reconstruction of bridges on the east and south sides, the erection of two wharves, and two flag poles. General repairs were also carried out on the massive buildings, such as laying of floors, replacing of windows, painting of roofs, etc. A number of war trophies were secured and forwarded to the island where they have been prominently placed. A standard tablet will be placed at the entrance to the fort, also one on a suitable location on the island to commemorate the battle of Ile-aux-Noix. The increasing popularity of the fort is evident by the large number of tourists who visited the island last summer. These numbered about two thousand.

Battle of Eccles Hill (County Missisquoi), P.Q.—Site of the battle of May 25, 1870, between the Fenian Invaders and the Canadian Volunteers and Home Guards, the former being repulsed with heavy losses. A monument, erected four miles from Frelighsburg, in commemoration of this event, by the Dominion Government, together with the site on which it is located, was transferred from the Department of National Defence to the control of the Interior Department by Order in Council, of October 16, 1922.

Eastern Ontario

Glengarry Cairn, near South Lancaster, Ont.—Situated on Monument Island, St. Lawrence river, county of Glengarry. This cairn, of conical shape, fifty-two feet high and fifty-two feet in diameter at the base, with a winding staircase, was erected by the Highland Militia of Glengarry, which was concerned with the suppression of the Canadian Rebellion of 1837-38, to commemorate the services of the distinguished soldier, Sir John Colborne, who commanded Her Majesty's forces in Canada at this critical period. The property was purchased from the Department of Indian Affairs and a caretaker has been appointed.

Fort Wellington, Prescott, Ont.—Situated on the Provincial Highway within the town limits and comprises an area of eight and one-half acres, on which are situated a blockhouse, caretaker's dwelling and two other buildings. Constructed in 1812-13 as the main post for defence of the communication between Kingston and Montreal. Here was assembled the force which took Ogdensburg on February 22, 1813, and the troops engaged in repelling the invasion at the Windmill, November 11-13, 1838. The site has been transferred from the Department of National Defence to the control of the Interior Department by Order in Council.

Ernestown Shipyard, Bath, Ont.—Here was built in 1816 the first steamboat which navigated lake Ontario. A plot of land adjacent to the Provincial Highway at Finkle's point has been donated by Mr. Thomas Wesley Thompkins, upon which to have a cairn and tablet erected.

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Point au Baril, Maitland, Ont.—Site of a small shipyard established by the French in the summer of 1758 near the village of Maitland. Here in April, 1759, they launched and completed two small ships of war, which were equipped and manned and continued to cruise lake Ontario until the conquest of 1760, when they both were taken. The site is privately owned by Dr. R. E. Webster, who has promised the Department of the Interior permission to place a tablet on the walls of an old tower located thereon.

Western Ontario

Mission of St. Ignace, Ont.—Situated in the township of Tay, on the farm of Chas. E. Newton. Site of Huron village captured by the Iroquois on March 16, 1649, and of the place to which Breboeuf and Lalement were brought and where they were tortured to death. No visible remains. An area of one and three-quarter acres, together with a right of way, has been donated to the department by Mr. Newton for the erection of a cairn and tablet.

Navy Island Shipyard, Ont.—Situated on Navy island, in the Niagara river, near Chippawa, Ont. Established under the direction of the military authorities in 1761 and maintained until 1763. Three small schooners and a number of smaller craft were built there. Owing to its inaccessibility, a monument and tablet are to be erected on the Niagara boulevard, opposite the island. Arrangements have been made with the Niagara Falls Park Commission for the erection of a monument.

Point de Meuron, near Fort William, Ontario.—Situated at the foot of the rapids on the Kaministiquia river. A portage point for the early fur traders and explorers. The de Meuron regiment wintered here in 1816. A site located at Pointe de Meuron Crescent has been secured for the erection of a cairn and tablet.

Port Stanley, Ont.—Situated at the mouth of Kettle creek. Site of arrival of Joliet in September, 1669, Dollier and Galinee in April, 1670, and the halt of Brock on his way to Amherstburg, Ont., August 9-10, 1812. The municipal council have, by resolution, donated a site at the junction of Bridge, Main, Joseph, and Colborne streets, for the erection of a cairn and tablet.

Western Canada

Northwest Rebellion, 1885.—It has been decided that the several sites associated with the Northwest Rebellion should be suitably marked.

Battle of Fish Creek, Saskatchewan.—Situated in a ravine on section 23, township 41, range 2, west of the 3rd meridian, about ten miles from Batoche. Site of the Battle of April 24 between Riel's forces and the troops under General Middleton. Legal Subdivision 15, was by Order in Council of May 24, 1916, withdrawn from the operations of the Dominion Lands Act and it was established a historical site under the control of this branch on January 17, 1922. A caretaker was appointed.

PRESENT WORK

In addition to extension of work on the foregoing sites, work is at present being laid out in connection with preserving and marking the following sites of national importance:—

Fort Lawrence, near Amherst, N.S.

Battle of Grand Pre, near Grand Pre, N.S.

St. Maurice Forges, near Three Rivers, P.Q.

Battle of Three Rivers, Three Rivers, P.Q.

Second Battle of Laprairie, Laprairie, P.Q.
 Fort Sorel, Sorel, P.Q.
 Fort Longueuil, Longueuil, P.Q.
 Fort Charlesbourg Royal (Cap Rouge), P.Q.
 Tadoussac, P.Q.
 Three Rivers Massacre, Platon and Fort, Three Rivers, P.Q.
 Coteau du Lac, P.Q.
 Old Simcoe Building, Kingston, Ont.
 Battlefield of Ridgeway, Ont.
 Weishuhn's Redoubt near Willoughby, Ont.
 Port Talbot, Ont.
 Point Pelee, Ont.
 Port Dover, Ont.
 Sandwich, Ont.
 Frog Lake Massacre, Alberta.
 Duck Lake Battlefield, Sask.
 Batoche, Sask.
 Cutknife Battlefield, Sask.
 Battleford, Sask.
 Battle of Seven Oaks, Winnipeg, Man.
 Fort Langley, B.C.

WORK FOR THE FUTURE

The following historic sites have been recommended for action by the Historic Sites and Monuments Board:—

Maritime Provinces

Champlain's habitation, Port Royal, N.S.
 Landing of United Empire Loyalists, St. John, N.B.
 Site of first printing press in Canada, Halifax, N.S.

Quebec

Hochelaga, Montreal, P.Q.	Chateauguay Battle and Blockhouse,
Fort Crevier, St. Francois du Lac, P.Q.	Allan's Corners, P.Q.
Battle of Lacolle and Lacolle Block-	Gaspé, P.Q. (Landing place of Jacques
house, Lacolle, P.Q.	Cartier).
Fort Remy, P.Q.	Fort Gentilly, P.Q.
Fort Cuillerier, P.Q.	Fort Rolland, P.Q.
Fort Senneville, P.Q.	Fort Verdun, P.Q.
Arbre-a-la-Croix (Cap Madeleine),	Madeleine de Vercheres, P.Q.
P.Q.	Lachine Massacre, 1689, near Montreal,
Battle of Riviere-des-Prairies (Coulee	P.Q.
Groulx), P.Q.	Battle of Cedres, above Montreal, P.Q.
Lachenaie, near Terrebonne, P.Q.	Fort St. Jean, St. John, P.Q.
Fort Ste. Theresa, near St. John, P.Q.	Fort Maisonneuve, at Pointe Calliere,
Odeltown, P.Q.	Montreal, P.Q.
Battle of de Repentigny, P.Q.	

Eastern Ontario

Glengarry House, near Cornwall, Ont.
 Windmill Point, near Prescott, Ont.
 Chrysler's Farm, near Morrisburg, Ont.
 Gananoque, Ont.
 Fort Levis, Batteries at Adam's Point, near Cardinal, Ont.
 Fort Cataraqui or Frontenac, Kingston, Ont.

Western Ontario

Southwold Earthworks, near St. Thomas, Ont.
Mission of Ste. Marie I, near Midland, Ont.
Mission of Ste. Marie II, Christian Island, Ont.
Chippawa Battlefield, near Niagara Falls, Ont.
Frenchman's Creek Battlefield, near Bridgeburg, Ont.
Vrooman's Battery, near Queenston, Ont.
Battle of Cook's Mills, near Welland, Ont.
Battle of Fort George, near Niagara, Ont.
Battle of Beechwoods or Beaverdams, near Thorold, Ont.
Site of Tete de Pont Battery, near Chippawa, Ont.
Sault Ste. Marie, Ont.
Port Arthur, Ont.
Fort William, Ont.
Fort Nottawasaga, near Stayner, Ont.
Battle of the Longwoods, near Wardsville, Ont.
Fort Norfolk, Turkey Point, Ont.
Fort St. Joseph, near Richard's Landing, Ont.
Normandale Blast Furnaces, Normandale, Ont.

Western Canada

Clark's Crossing, now Clarkboro, about nine miles from Saskatoon, Sask.
Fort Pitt, Sask.
Fort Livingstone, Man.
Friendly Cove, Nootka Sound, B.C.

The Alpine Club of Canada

(Report prepared by the Secretary)

The club house had its usual quota of happy and contented guests all the summer season. The familiar climbs were made, but nothing original was attempted. Mount Norquay again proved a most interesting training climb. Many visitors came from the hotels to get information about the more remote mountain regions of Canada, and how best to visit them. The "facts" tourists pick up before visiting the mountains are often both remarkable and interesting. Members of European Alpine clubs seldom pass through Banff without making a call on the Alpine Club of Canada, which has become so well known since the congress at Monaco.

The most interesting and interested visitors were the delegates visiting Canada from both of the British Houses of Parliament, who examined the striking collections of maps and pictures of the Canadian mountain regions with great admiration and were strongly appreciative of the good work the club is doing for the country.

Mrs. Stone presented to the club, in memory of her husband, all the latter's albums of Canadian mountain views and a large collection of photographic

slides. These treasures will be a source of continued pleasure to many, and the gift is greatly appreciated. The memory of Dr. Stone will ever be kept green.

Major E. O. Wheeler has presented the club with two very fine enlargements, sixteen by twenty-one inches in size, of photographs taken by himself while on the Mount Everest expedition of 1921. One represents Mount Everest itself taken from above the 20,000 foot camp in the Kharta valley, the other, that singularly magnificent mountain, mount Makalu, taken from the north. These will add further distinction to the already very fine collection of pictures at the club house.

Mrs. Daniel Davies, of Edmonton, presented a beautiful water colour painting from her own brush, "The Sisters of The Selkirks". It was greatly admired. Mr. and Mrs. Maxwell, who at present live in the United States, gave a very handsome pair of andirons for the assembly room fireplace, a long needed and much appreciated gift. The guests at the club house came from all over Canada and the United States as well as from England, India and far away Australia.

REPORT OF THE ANNUAL CAMP AT PALLISER PASS

(Prepared by the Secretary)

The seventeenth annual camp of the Alpine Club of Canada was held at Palliser Pass summit from July 29 to August 12, 1922.

For the third time in its history the club held a camp at a long distance from the railroad and from any base of supplies. In 1913 a camp was held at Berg lake, at the foot of mount Robson; in 1920 at mount Assiniboine. Again as in 1920, advantage was taken of the exceedingly convenient camps of the mount Assiniboine walking tour route. Nights were spent at the Eau Claire, the fishing, and the trail centre camps. From the last the trail branched off that to mount Assiniboine and followed the Spray river to its head.

Palliser pass is the entrance to a magnificent mountain region which only became known to the world at large when the report of the Interprovincial Boundary Commission was published in 1916. It is, unfortunately, somewhat out of the way, but it is a country of the greatest interest. The mountaineering and the geographical public are looking forward to the issue of the second part of this report, in anticipation that other fine spheres of action may be revealed to them.

The camp was pitched close to Belgium lake at an elevation of somewhat less than 7,000 feet, in a most picturesque situation. The most prominent feature was mount Queen Elizabeth (of Belgium). Facing the ladies' quarters a striking waterfall came down from the Albert glacier above and the hillside was covered with mountain flowers. Late as it was in the season the glacier lilies (*Erythronium*) were plentiful, as well as other familiar friends.

A subsidiary camp was pitched at North Kananaskis pass in the centre of the British Military and Naval group. This was even more beautiful than the main camp and from it several good climbs were made. Close by was the striking Turbine canyon into which the stream from the Haig glacier drops by a circular funnel-like hole with a thunderous roar that suggests a turbine in action.

The climbing, on the whole, is more difficult than that surrounding the average camps of the club. Before the camp opened members had climbed—both first ascents—mounts Queen May and Birdwood. During the life of the camp first ascents were made of mounts King Albert, Maude, and Tipperary, and second ascents of mounts Jellicoe, Back, Sir Douglas, Beatty, and Queen Elizabeth. Mount King Albert was only conquered on the second assault.

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The mount Sir Douglas party was a large one entailing slow going, and it was early in the following morning before the party reached home. The first party on mount King Albert was also benighted but in neither case was anyone the worse.

An attempt was also made on Sir Douglas from the Kananaskis camp, but it was found impracticable at about 800 feet from the top. On the same day mount Robertson was attempted via Haig glacier and the ridge from the col between Sir Douglas and Robertson, but the party had to turn back, reaching an impasse when almost at the top.

The return trip from Kananaskis to Palliser camp was made several times by way of the Haig glacier and the pass between mounts Robertson and Sir Douglas; thence by an unnamed glacier to the Spray valley. These glaciers had many glacier tables and interesting moulins.

The Swiss guides, kindly lent by the Canadian Pacific Railway Hotel Department, were Ernst Feuz and Rudolph Aemmer. As always, they gave excellent and highly appreciated service.

Among the guests present were Mr. A. L. Mumm, formerly vice-president of the English Alpine Club and a life member of the Canadian Club, who finds a charm in the Rockies of Canada different if not greater than that of the mountains on the three other continents on which he has climbed and explored. There were also two climbers of the early days, Sir James Outram, whose "In the Heart of the Canadian Rockies" is a mountaineering classic, and Rev. H. P. Nichols, of New York, whose name is associated with many of the early expeditions.

There were 107 placed under canvas, among them representatives of the Alpine Club, England, the American and Swiss clubs, the Appalachian Mountain Club, the Mountaineers, the Mazamas, the Sierra Club, and the Royal Geographical Society. Those present were drawn from the following portions of Canada, the British Isles, and the United States:—

Canada.—British Columbia, Alberta, Saskatchewan, Manitoba and Ontario.

British Isles.—England.

United States.—California, District of Columbia, Illinois, Massachusetts, Michigan, Minnesota, New Hampshire, New York, Oregon and Pennsylvania.

PART III

FORESTRY

REPORT OF THE DIRECTOR OF FORESTRY, R. H. CAMPBELL

This report covers the work of the Forestry Branch for the fiscal year 1922-23, ended March 31, 1923.

Continued depression in the great agricultural industry of Western Canada in common with other parts of the world reacted adversely on the general economic conditions of the country. The very small decrease in Forestry Branch revenue (\$2,405) is, under the circumstances, very satisfactory. It demonstrates the importance of the natural resources disposed of by this branch in fulfilling essential needs of the communities served. While the total number of permits to cut timber decreased, the quantity taken increased, particularly saw-logs and mining timber. The total number of stock grazed on forest-reserve ranges, as was to be expected, decreased about 10,000 head. Nevertheless, the number of individuals receiving grazing permits increased eleven per cent, indicating more widespread realization of the facilities available. It may be expected, therefore, that the amelioration of conditions in the stock industry will be reflected in increased use of forest range. Tree planting on prairie farms is rapidly assuming a new phase, namely, protection against soil-drifting, in addition to the original use in protecting buildings and beautifying surroundings.

FIRE PROTECTION

Manitoba and Saskatchewan had very favourable seasons from the standpoint of fire protection. In Alberta and British Columbia, on the other hand, the fire season was unusually severe. In Alberta the season was at least as bad as 1910, which has hitherto been considered the worst since the Forestry Branch established its fire-protection system. Since that year, though greater facilities exist for detecting and controlling fires, fire-hazards, especially those arising from settlers, campers, and railways, have greatly increased.

The total number of fires reported was 2,561; number of large fires, 575 (22.5 per cent of the total); total area burned over, 669,980 acres; area covered with merchantable timber, 187,364 acres; area covered with young growth, 200,099 acres.

FIRES WITHIN FOREST RESERVES

Cause	1922		1921		1920	
	Number	Per cent of Total	Number	Per cent of Total	Number	Per cent of Total
Unknown.....	60	11	32	11	43	20
Campers and travellers.....	51	9	28	9	28	13
Settlers.....	28	5	10	3	11	5
Railways.....	388	66	193	65	94	44
Lightning.....	12	2	9	3	27	12
Lumbering.....					2	1
Incendiary.....	34	6	23	8	2	1
Brush disposal other than by settlers...	1		1		2	1
Other known causes.....	8	1	4	1	7	3
Totals.....	582	100	300	100	216	100

FIRES OUTSIDE FOREST RESERVES

Cause	1922		1921		1920	
	Number	Per cent of Total	Number	Per cent of Total	Number	Per cent of Total
Unknown.....	292	14	174	15	200	15
Campers and travellers.....	314	15	108	10	187	14
Settlers.....	705	35	329	29	106	8
Railways.....	486	24	370	33	596	46
Lightning.....	105	5	38	3	138	11
Lumbering.....	11		12	1	24	2
Incendiary.....	76	4	20	2	16	1
Brush disposal other than by settlers...	32	2	37	3	16	1
Other known causes.....	30	1	46	4	33	2
Totals.....	2,051	100	1,134	100	1,316	100

TOTALS OF ALL FIRES ON DOMINION LANDS

Cause	1922		1921		1920	
	Number	Per cent of Total	Number	Per cent of Total	Number	Per cent of Total
Unknown.....	352	13	206	14	243	16
Campers and travellers.....	365	14	136	10	215	14
Settlers.....	733	29	339	24	117	8
Railways.....	874	34	563	39	690	45
Lightning.....	117	4	47	3	165	10
Lumbering.....	11		12	1	26	2
Incendiary.....	110	4	43	3	18	1
Brush disposal other than by settlers...	33	1	38	3	18	1
Other known causes.....	38	1	50	3	40	3
Totals.....	2,633	100	1,434	100	1,532	100

AEROPLANE PATROL

Aeroplane patrols were continued in the Manitoba and Alberta districts. In Manitoba in two of the three fire-fighting districts the planes were used and a comparatively small ground force was required. All fires in these districts were promptly detected and put out, with one exception, a fire burning

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in muskeg. In Alberta, the Rocky Mountains forest reserve from the International Boundary to the North Saskatchewan river was patrolled almost daily. The patrol sufficiently covered many parts of the reserves that are little travelled and difficult of access, and saved much of the rangers' time, which could, accordingly, be devoted to improvement work.

IMPROVEMENTS

In some districts, on account of the great amount of time spent in fire-fighting, improvement work was practically at a standstill. In others, good progress was made. The following is a summary of improvements:—

	Number		Miles
Cabins.....	5	Roads.....	³ / ₄
Ranger Station Houses	3	Trails.....	230 ⁴
Stables.....	7	Telephone lines.....	114
Lookout towers	12	Fireguards (cleared).....	52
		Fireguards (ploughed)	127 ³ / ₄

TIMBER OPERATIONS

Alberta reports an increase of a million feet of saw-timber taken out (constituting an increase of some twelve per cent over last year's figures). Other provinces, however, report decreases. In Saskatchewan the cut of cordwood was the largest on record, and Manitoba also reports an increased cut of fuel-wood. The cut of mining timber in Alberta showed a considerable decrease. In Saskatchewan a keen demand was experienced for railway ties. A striking feature of the timber operations in most of the provinces was the quantity of fire-killed and mature or overmature timber taken out, which will be a considerable aid to the better management of the forests. There has been close observance of the cutting regulations imposed by the forest-reserve regulations.

PLANTING ON RESERVES

During the year approximately 48 acres were planted on the various reserves. Some 138,090 trees, including 25,000 Scotch pine, 51,720 jack pine, 59,920 white spruce, 1,050 lodgepole pine, and 400 green ash were used for this purpose.

Approximately 50,000 of these trees were supplied by the nursery station at Indian Head, Saskatchewan, and the remainder were grown on small nurseries in various reserves. In addition, 114 pounds of jack pine and white spruce seed were used to sow about 36 acres.

GRAZING

The grazing industry has been passing through a period of depression, and consequently a decrease in the number of stock grazed is reported in all districts—that in Saskatchewan amounting to over 10 per cent. Conditions have been good in all districts, and cattle left the range in good shape. The benefits of co-operation as exemplified by the co-operative grazing associations are marked, and efforts are being made to make these associations still more beneficial by using this agency to encourage the breeding of better stock. Many inquiries are being received as to grazing possibilities in northern Alberta.

RECREATIONAL USES

The use of the summer resorts on the forest reserves is increasing. In Manitoba the Clear Lake summer resort in the Riding Mountain forest reserve had to be extended, and the demand for camping permits and summer-resort

lots in the British Columbia resorts was greater than could be met. In Saskatchewan one new summer-resort subdivision was opened for leasing. In order to take better care of the trout fishing on the British Columbia reserves a small hatchery was installed near Paul lake by the Department of Marine and Fisheries; varied success was obtained in the "planting" operations. In the Riding Mountain forest reserve, in Manitoba, the herd of elk is increasing (the reserve having been closed for big-game hunting for the past two years) and is now the largest elk herd in Canada.

RECONNAISSANCE

In Manitoba the reconnaissance of the country east of lake Winnipeg was continued, and included a detailed survey of the country along the Maskwa river and rapid reconnaissance of the country along the Little Black river. A survey and estimate of the Roaring River basin in the Duck Mountain reserve was started, and traverse surveys made of a number of roads in the Riding Mountain and Duck Mountain reserves.

In Saskatchewan detailed surveys were made of the Nisbet reserve and parts of the Pines, Pasquia, and Porcupine reserves, which gave information for an intensive forest-cover map.

In Alberta a grazing reconnaissance was made on the Crowsnest forest.

In British Columbia a forest-cover and topographical map of the Larch Hills reserve was made, together with a study of the different timber types.

TREE PLANTING ON PRAIRIE FARMS

Every year interest in tree planting on prairie homesteads is increasing. This is partly due to the efforts to establish field-shelters for the purpose of checking soil-drifting, partly to the desire of those who already have well-established shelter-belts to extend them. The number of such field-shelters planted this spring promises to treble those planted in 1922.

Weather conditions in the season of 1922 were generally favourable except for drought in certain parts of Alberta and Saskatchewan. Even in these latter areas the trees showed a very large proportion of survivals, due, doubtless, to the thorough soil preparations insisted on before planting. More detailed reports in regard to plantations were required of the promoters of tree planting in 1922. These showed that out of 832 plantations 71 per cent were good and 21 per cent fair. These latter, with a little more care for the next few years, can be put in good condition. Compared with plantations made under similar government schemes of co-operative planting in other countries, this showing seems quite satisfactory.

Conifer (evergreen) plantations have come through surprisingly well. This applies even to areas which have suffered severely from drought. Of lodgepole pine planted in central Alberta in 1916, the full 100 per cent has survived, and the average height attained is 7 feet 2 inches.

Rather more than the usual amount of damage was reported from hail in 1922, but practically no winter-killing. Insect pests were reported quite generally. The Russian poplar is afflicted by an insect, lately introduced, a kind of borer, whose attacks may seriously affect the usefulness of the Russian poplar for prairie planting. The season of 1922 was favourable for propagating most kinds of trees. Young green ash at Indian Head, however, were smothered owing to the caking of the soil caused by excessive spring rains, and a fine stand of freshly sown white spruce was "burned off" just after germinating, owing to extremely dry, hot weather. The number of applicants who received broad-leaved stock was 4,064, and 254 received conifers. Over four and a half

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million trees were distributed, and this spring (1923) nine and a quarter million are available for distribution. A considerable quantity of tree seed was collected and extracted; the supply of spruce, however, was extremely scanty. About fifty thousand conifer (evergreen) transplants were supplied for planting on the forest reserves, and experiments in direct seeding were continued on the Spruce Woods forest reserve in Manitoba.

FOREST PRODUCTS LABORATORIES

The fiscal year 1922-23 shows marked increase over 1921-22 in the number of requests for technical information and services, just as 1921-22 did over 1920-21, and the experimental paper-mill was employed more than in any previous year. The past year, too, has seen the largest and most varied research work of any year in the history of the laboratories. The chief problems under investigation included the making of sulphite pulp from jack pine, the making of wood-pulp from fire-killed spruce and balsam fir, the recovery of good paper stock from condemned paper currency withdrawn from circulation, the determination of the burning temperature of exposed chips in sulphite cooking, the feasibility of applying the freeness test as a control in ground-wood production, and the chemistry of cellulose. Of these the second, third, and fourth were successfully completed; the others are still under investigation. The Division of Timber Physics began a study of the built-up type of construction (plywood or laminated wood), especially as applied to sporting goods, kiln-drying, water storage of ground-wood pulp, and the decay of timber in buildings. In the last two studies valuable results were obtained. The preparation of the reference collection of microscopic slides of wood was continued. The Division of Timber Tests continued their work of testing the strength functions of Canadian commercial timbers, made further investigations in regard to the nail-holding characteristics of woods, and conducted research on the value of glues of various kinds for joint work and the strength values of Canadian woods for tie purposes. In the Division of Wood Preservation the major investigations were the creosote treatment of maple and aspen poplar for railway ties, and the treatment of Canadian hardwoods for top pins and pole brackets for use in connection with telegraph and telephone lines. Many other minor investigations were also carried on. A number of exhibits of forest products and articles derived therefrom were prepared. Many technical articles and brief newspaper items were prepared by the staff during the year.

FOREST RESEARCH WORK

The scheme of investigation as outlined in the report for the year 1921-22 was followed during the past fiscal year. Investigations were carried on in Ontario, New Brunswick and Quebec, and on the Dominion forest reserves in the western provinces.

In New Brunswick studies subsidiary to the work at the Bathurst experimental area were undertaken in co-operation with the New Brunswick Forest Service, and with Mr. P. Kingston, Wayerton, Northumberland county, and Mr. W. S. Anderson, Cain river, York county. At Wayerton a regeneration survey was carried on, and on Cain river preliminary arrangements were made for an experimental cutting.

At the Petawawa forest experiment station in Ontario, the work carried on consisted mainly of investigation of methods of handling young growth coming in after logging or after fires. This particular problem is of importance now and will assume greater importance as the present supplies of pine, spruce, and other softwoods decrease.

At the Lake Edward forest experiment station in Quebec, investigations of methods of handling severely culled pulpwood lands in the yellow birch or hardwood type were continued.

The work on methods of estimating standing timber for commercial purposes has now reached the stage when results can be applied to five of the main forest species in Eastern Canada. About fifty separate investigations on the majority of the main species have been carried on throughout the East and on the Dominion forest reserves in Western Canada. Measurements have been made on about 5,000 trees. The specific object of this work was to develop general data, applicable over wide regions, from which data local tables can be prepared to suit local conditions. The results obtained from these separate investigations have been co-ordinated, and it has been demonstrated that general taper tables can be applied to three species in the regions noted, namely: (1) balsam fir in Quebec, New Brunswick, and Manitoba; (2) white spruce, red spruce, and black spruce in Quebec, Ontario, New Brunswick, and Manitoba; and (3) white pine in Ontario.

From these general taper tables it is possible, subject to the collection of a small amount of local data, to develop local volume tables for any product, or to conform with any type of operation desired. The work on red pine, jack pine, lodgepole pine, and other species is in progress. There is every indication that successful results may be obtained for these species also.

Measurement and study of yield of the important Canadian species in the natural and thinned forests, as related to the problem of securing the highest production, was continued, this work being carried on simultaneously with the work on methods of estimating.

FOREST RESOURCES AND STATISTICS

The work of this division is being constantly broadened and extended, by co-operation with outside agencies and otherwise, in an effort to meet and serve the public needs most fully and satisfactorily, and especially with regard to providing fuller and more reliable information on the location and extent of Canada's commercial forest resources.

So far as forest conditions are concerned, two main considerations govern the framing of any Canadian forest policy, whether federal or provincial, which seeks to harmonize annual cut with annual growth, namely, for any given area, first, the acreage and quality of mature timber, and, second, the acreage and growth-rate of the reproduction.

To secure at least approximate answers to these two questions, the Commission of Conservation undertook to carry out a comprehensive forest survey of Canada, province by province; and, when the commission was disbanded in 1921, Nova Scotia and British Columbia had been covered and surveys in Saskatchewan and Ontario were well under way. This work was taken over by the Forest Resources and Statistics Division of the Dominion Forest Service, and the Ontario survey is now nearing completion. In this general forest inventory or stocktaking much the same methods are being employed as were successfully adopted in the survey of British Columbia. Through co-operation with the lumbermen and pulp concerns, estimates of their holdings are being secured and compiled. The mass of data in the hands of the Provincial Government is also freely available. The fullest co-operation, too, is being given by the banks, railways, and other persons or companies who may possess information of value. Finally, in order to relate these estimates, and check them where desired, it is necessary to do considerable direct field-work of a reconnaissance nature. It was at one time expected that this project would be rapidly advanced by the use of aeroplanes in co-operation with the Air Board

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of Canada, and considerable information has been secured in this manner, especially through the co-operation of the Provincial Forestry Branch, which has carried on extensive aerial surveys during the last two years.

In addition to the above special investigation, all the available information concerning the forest resources of Canada is being compiled and the estimates of the total stand of merchantable timber in Canada are revised from time to time as more definite and authoritative information is secured.

During the fiscal year under review, considerable work was done in the matter of collecting and compiling statistics dealing with the use and manufacture of forest products, both in co-operation with the Dominion Bureau of Statistics and independently. This work involves revising of schedules and checking and editing of final reports. One such investigation made by this division covers the probable supply, utilization, and relative heating values of the different fuel-woods used in Canada as compared with mineral fuel, and in connection therewith a report was prepared and presented before the Canadian Mining Institute in Montreal. It was also published for distribution.

Inquiries are constantly being received by this division, asking for definite information in regard to the amount and location of supplies of timber for use in woodworking industries, particularly with reference to the rapidly expanding pulp and paper industry. This phase of the work now involves considerable correspondence, and it is felt that the information thus being made available to persons and companies seeking to locate new industries in this country is serving a most important and useful purpose.

PUBLICATIONS AND PUBLICITY

During the year the following new publications have been issued: Bulletin No. 72, "Success in Prairie Tree Planting"; Bulletin No. 73, "Tree-repairing"; Bulletin No. 74, "Distillation of Hardwoods in Canada"; Circular No. 14, "Commercial Forest Trees of Canada"; Circular No. 15, "Historical Sketch of Canada's Timber Industry". Monthly news-letters were sent to newspapers, and other means of publicity, particularly in regard to forest fires, were continued. Arrangements are also being made to have messages regarding forest fires broadcasted from some of the radio broadcasting stations.

THE LIBRARY

The preparation of monthly lists of accessions, which are mimeographed and circulated among the officers of the branch and a number of forestry officials, foresters, and others interested, and also of special bibliographies or reference lists has been continued. The subject index of photographs has been brought up to date, and now includes some 13,000 entries; a geographical list is also being prepared. During the year 573 books and pamphlets and 1,092 photographs were added to the library. Book loans totalled 673, and 2,857 cards were added to the index.

STAFF

The total permanent staff of the Forestry Branch for the past year was as follows:—

Head office.....	60
District inspectors.....	4
Assistant district inspectors.....	2
Forest supervisors.....	18
Foresters and forestry assistants.....	25
Forest rangers.....	93
Chief fire rangers.....	11
Promoters of tree planting.....	8
Forest Products Laboratories technical staff.....	26
Outside clerical staff.....	47

APPROPRIATIONS

The appropriation for the fiscal year was \$1,000,000; to this are to be added refunds from fire-guarding, etc., \$35,392.72. The total available for expenditure was thus \$1,035,392.72. The expenditure was divided as follows:—

Salaries at head office.....	\$ 25,595 90
Travelling expenses.....	3,809 29
Printing and stationery.....	2,771 34
Miscellaneous expenses.....	12,972 52
Statistics.....	4,427 50
Fire-ranging.....	287,480 81
Forest reserves.....	472,538 62
Surveys and research.....	66,120 11
Tree planting.....	71,368 25
Forest Products Laboratories.....	84,746 46
	<hr/>
	\$ 1,031,830 80

The field expenditure in the western provinces, exclusive of tree planting on prairie farms, is divided as follows:—

Manitoba.....	\$ 99,614 04
Saskatchewan.....	185,198 05
Alberta.....	291,570 43
British Columbia (Railway Belt).....	200,700 08
	<hr/>
	\$777,082 60

THE TREE-PLANTING DIVISION

Norman M. Ross, Chief

Generally speaking, the season of 1922 was favourable for tree-planting work over the greater portion of the three Prairie Provinces. Certain restricted areas suffered again from extreme drought, but with the exception of these comparatively small areas the rainfall was normal and in some districts even above normal, particularly in spring and early summer.

In the dry areas mentioned a summary of inspection reports indicates that early in the season the freshly set out plantations showed 94 per cent of plants living. Later, however, owing to the prolonged drought during the growing season, the plantations in these districts, especially those of cuttings, suffered, though the rooted seedlings held their own fairly well. The average of all the varieties in the plantations would be about 85 per cent living. This is considered a splendid showing under the conditions, and can be accounted for only from the fact that trees are supplied for planting only on well-prepared summer-fallowed land.

In the more favourable sections, which comprise at least three-quarters of the area covered by the branch's distribution the inspection of living, freshly planted stock showed 98 per cent of rooted stock and 90 per cent of cutting stock.

In the inspection district covering the southern and eastern portion of Saskatchewan 832 plantations varying in age from 3 to 15 years old are reported as 590 (71 per cent) good, 175 (21 per cent) fair, and 67 (8 per cent) poor. All the plantations reported fair can be put in good condition if the owners will give them a little more care during the next few years. These results compare favourably with those obtained in the northern prairie states as given in Bulletin No. 1113 of the United States Department of Agriculture.

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General interest in tree planting is becoming keener each season. From lists compiled to date it is evident that the total number of trees sent out will be over two and a half millions greater than the number set out in 1920.

Two things are particularly noticeable in the correspondence this spring: one is the very large number of farmers who set out small shelter-belts perhaps eight to ten years ago who are feeling the benefits of these earlier plantings and are now anxious to extend their plantations; the other striking feature of the work is the numerous inquiries received regarding field-shelters, to protect crops from soil-drifting. Until two years ago no demand was expressed for stock for other than shelter-belts to set immediately around the farm buildings and gardens. In 1922 stock was supplied for thirty-two field-shelters, and this spring over 100 farmers are arranging to set out field shelter-belts. These field-shelters consist generally of from one to four rows that have been planted, to start with, along the outside edges of the farms; later, secondary belts will be, and in some cases already have been, planted at suitable intervals across the cultivated fields. It is hoped that such belts will not only help to lessen loss from soil-drifting, but will tend to control the spread of such weeds as Russian thistle.

Extremely encouraging reports are received from every inspection district in regard to results with conifer (evergreen) plantings. The species sent out from the nurseries are white spruce, Scotch pine, jack pine, and lodgepole pine. During the past season very few of the newly-planted trees failed, and several reports show 100 per cent living. Even in the areas which have suffered drought the conifers are showing up splendidly, as the following figures covering plantings in central Alberta clearly demonstrate:—

White spruce, planted 1916, height 6 ft., 98 per cent living.
Lodgepole pine, planted 1916, height 7 ft. 2 in., 100 per cent living.
White spruce, planted 1918, height 5 ft., 97 per cent living.
Scotch pine, planted 1918, height 5 ft. 4 in., 94 per cent living.
White spruce, planted 1922, 96 per cent living.
Jack pine, planted 1922, 93 per cent living.
Scotch pine, planted 1922, 94 per cent living.

Undoubtedly these hardy conifers (evergreens) are particularly suited to prairie planting and, once established, seem to withstand all kinds of neglect, though they respond readily to good cultivation.

Rather more damage than usual was reported during the past season from hail, but no winter-killing was reported except in south-central Alberta, where maple, set out one or two years previously, was slightly cut back. Experience shows, however, that winter-killing seldom affects these trees after the third or fourth season.

Insect pests, such as canker-worm on the maple and certain species of aphids on poplars and willows, were reported pretty generally, but these can all be controlled with a fair degree of satisfaction by the use of insecticides ordinarily available. Very serious outbreaks of tent caterpillars were reported as doing a great deal of damage to native "bluffs" and poplar stands. These outbreaks were most serious in the Moose mountains, in southeastern Saskatchewan, and in an area south of Edmonton. No damage was reported from tent caterpillars in any cultivated plantations, but this insect may be found rather troublesome during the coming summer.

A new pest affecting young Russian poplar was reported in 1921 for the first time, but was found much more plentiful in 1922. The injury is caused by the larva or grub, apparently of a species of moth, which enters the stem of freshly rooted Russian poplars at a point level with the ground-line. It bores into the stem and develops there, weakening the plant to such an extent

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that in the fall of the second season the stem breaks off at the ground-line. In some new plantations from 30 to 50 per cent of the young poplars were broken off from this cause. It is not known yet just what effect this will have on the injured plants, but it is being closely watched because if it proves to be a serious pest the result may be greatly to restrict the use of Russian poplar in prairie plantations.

Nursery Work.—The stock raised at both Indian Head and Sutherland nurseries was of excellent quality; the season was, on the whole, a very favourable one for the propagation of most species. Owing to continuous heavy rains in the early spring the soil in the plots sown to ash became so packed and hard that the young plants could not break through. The surface was so hard that the harrows had no effect on it. As a consequence, these plots were a complete failure and there will be no ash available from Indian Head nursery for 1923. A larger area of caragana was sown in the fall of 1922 to take care of this shortage. The only other crop suffering was freshly-sown white spruce. Just at the time these were germinating there occurred an intensely dry, hot period, and a beautiful stand of young plants was completely "burned off," as there were no facilities for watering. A pumping plant with an overhead watering system was installed later in the season, which will, it is hoped, prevent similar loss in the future.

Distribution of Broad-leaved Stock.—Shipping of broad-leaved stock commenced April 29 and was completed May 11 as follows:—

Number of applicants receiving trees.....	4,064
Seedlings and cuttings distributed.....	4,625,225
Average number per applicant.....	1,150
Number of applicants on inspection list, 1922.....	8,186
Number of new applicants on inspection list for 1923, approximately...	2,061

The following stock of broad-leaved material is available this spring (1923) for distribution at the Indian Head and Sutherland nurseries: Manitoba maple, 2,168,000; green ash, 2,280,000; Russian poplar, 854,000; red willow, 344,000; acute-leaved willow, 516,000; laurel willow, 582,000; caragana, 2,528,000; total, 9,272,000.

Distribution of Conifers.—Shipments started May 17 and were completed May 20. Applicants numbering 254 were supplied with conifer transplants, at a nominal charge, as follows: White spruce, 21,900; jack pine, 7,250; Scotch pine, 17,850; total, 47,000. In addition to these, 50,000 transplants were shipped for planting on the forest reserves, making a total of 97,000 conifers sent out.

Collection of Tree Seed.—Maple seed to the amount of 2,858 pounds was collected, mostly at Dauphin; 236 pounds of ash seed were collected in the Qu'Appelle valley, and 500 pounds of caragana seed were collected on the nursery.

Twenty-eight and one-quarter bushels of lodgepole pine cones collected in the foothills gave eight pounds of clean seed; 92 bushels of jack pine cones from the Prince Albert district gave 52 pounds of clean seed, and 5 bushels of white spruce gave 4 pounds of clean seed. This was not a seed year for spruce in any part of the country. The seed was all extracted and cleaned at Indian Head.

In the spring of 1922, 40 pounds of maple seed, 30 pounds of ash, and 65 pounds of caragana were distributed among 121 applicants.

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Planting in the Forest Reserves.—Stock for planting on the forest reserves was shipped as follows:—

Manitoba—					
Riding Mountain.....	1,800	spruce,	1,600	jack pine,	500 Scotch pine.
Duck Mountain.....	750	"	750	"	750 "
Spruce Woods.....	1,400	"	1,150	"	7,000 "
Turtle Mountain.....	1,050	"			
Saskatchewan—					
Nisbet.....			1,750	"	5,475 "
Dundurn.....			1,750	"	2,775 "
Beaver Hills.....	5,000	spruce,			
Alberta—					
Crowsnest.....	2,500	"	1,500	"	4,250 "
Bow River.....	2,500	"	1,500	"	4,250 "

For continued experiments in direct seeding on the Spruce Woods reserve in Manitoba, 50 pounds of jack pine seed were forwarded to be sown in the spring and 20 pounds to be sown in the fall of 1922. Previous sowing had been made principally broadcast, the seed-bed having first been disked in order to secure a certain degree of preparation of the soil. This season most of the seed was put in with an ordinary grain disk-drill without preparing the seed-bed in any way in order to test this method.

DOMINION FORESTS IN MANITOBA

H. I. Stevenson, District Forest Inspector.

The Manitoba inspection district office is charged with the administration and protection of the Dominion forest reserves within the province generally and with the protection of timber on Crown lands within the province.

Fire Protection.—The summer of 1922 was one of comparatively low fire-hazard. Rainfall was above the average for all parts of the province except the northern districts. Early frosts followed by high temperatures and strong winds culminated in a great danger period during the last week of September, which condition was relieved by general rains on October 4. By the end of October there was no longer any danger of fires running and patrols were discontinued for the year.

The total number of fires during the summer was 107. Of this number 27, or 25 per cent, burned over 10 acres. This shows an improvement over the preceding two years; in 1921 large fires (over 10 acres) formed 38 per cent of the 86 fires reported, and in 1920 the percentage was 54 with a total of 122 fires. This reduction in the percentage of large fires is due to improvements in organization and increased efficiency of the staff. These 27 large fires of last year burnt over 27,851 acres, of which a little over 2,000 acres contained merchantable timber and about 8,000 acres young growth, the remainder being old burns, grass land or muskeg.

The forest-reserve staff handled 15 large fires, of which 8 were outside the boundaries of the reserves. These 8 fires were on agricultural land and were started by settlers. They were fought by the reserve staffs in order to prevent their spread to the reserves. The volunteer fire-fighting organization inaugurated the preceding year amongst the settlers adjacent to the reserves has given satisfactory results.

Four additional fire pumps were purchased and sent to central points throughout the province. These proved most efficient.

The operation of the seaplanes and the handling of fires were greatly facilitated by the radio stations established at Winnipeg, Victoria Beach, and Norway House by the Canadian Signal Service. Messages were sent from Winnipeg to Norway House and replies received in a few hours—an exchange which formerly took weeks. This rapid means of communication enabled the inspection office to keep in close touch with the aeroplane operations and with the Manitoba North district.

Aeroplane Patrols.—In the fire-ranging districts patrols were carried out largely by the use of seaplanes. These machines did very efficient work while they were in operation but, owing to a series of accidents, not enough machines were available for the service, which in some localities had to be supplemented by canoe patrols. The Manitoba North and Manitoba South districts were patrolled by the planes throughout the summer, being supplemented by only a small ground force. All fires in the country patrolled by them were sighted before they had gained much headway and were easily extinguished with the exception of one at the outlet of lake Winnipeg. This fire was burning in muskeg and gave considerable trouble before it was finally put out. The planes have proved their usefulness in fire detection and suppression, but from the last season's operations the necessity of having a surplus of machines in reserve was strongly emphasized.

Improvements.—Portions of the Duck Mountain reserve are not yet easily accessible and considerable improvement work must be carried out here. On the other reserves lines of communication and transportation with the necessary buildings for the staff have been established and but little new construction will be required.

Silviculture.—Due to the continued financial depression, very little saw material was cut from the reserves during the winter, but there was an increase in the number and amount of permits taken out for fuel. Aspen was the principal species cut for this purpose, and as it covers extensive areas, is badly diseased, and is growing faster than it is being cut, this is a distinct advantage.

A number of plantations of an experimental nature were established on the various reserves, and as the season was very favourable for growth they are doing well. Many of the plantations made in previous years are showing gratifying results, and valuable information is being obtained from these plantations. Some sowing has also been done, but without satisfactory results to date. During the past winter the cutting of poplar on certain specified areas was permitted free of dues. These areas were clear-cut, and it is the intention to burn these broadcast and sow spruce seed. If a good seed-bed can be prepared by burning, these extensive poplar areas can gradually be converted into valuable spruce forests. Seed-beds of spruce and jack pine were established at a number of ranger stations.

The technical staff attached to the district have been carrying out various lines of investigative work. Work on the permanent sample plots previously established was continued and several new plots established. A preliminary report on the silvical conditions on the Riding and Duck Mountain reserves was prepared through the co-operation of this staff.

Surveys and Estimates.—The survey and estimate of timber started in 1921 on the east side of lake Winnipeg was continued. This year the country along the Maskwa was examined in detail and a rapid reconnaissance made along the Little Black river.

A survey and estimate of the timber tributary to the Roaring river in the Duck Mountain reserve was started. This work will be completed next year.

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Grazing.—Owing to the general depression, grazing on the forest reserves has fallen off during the last few years. During the past year the number of permits issued and the number of head grazed were below normal. It is expected that with the revival of business the forest reserves will be used to a much greater extent than heretofore. The stockmen and farmers are now fully aware of the advantages of these reserves for summer feed and when the market justifies the building up of their herds numerous requests for pasturage may be expected. The co-operative grazing associations are growing in favour and are encouraged in every way.

Cattle on the range did very well last summer, and they were well conditioned in the fall. No loss of stock was reported from any of the reserves.

Recreational Uses of Forest Reserves.—Owing to the proximity of the forest reserves in this province to towns and villages they are being used more and more for recreational purposes. The summer resorts established at Madge lake in the Duck mountains and at Clear lake in the Riding mountains are growing in popular favour. At the Clear Lake resort it was necessary to extend the subdivision to a total of 129 lots.

Game.—The Riding Mountain reserve has, by a provincial Act, been closed for big-game hunting for the past two years and it is gratifying to note that the elk on this reserve are increasing under this protection. This herd of elk is the largest in Canada. Big game on the Duck Mountain reserve is on the decrease, and a close season on this reserve may also be necessary.

DOMINION FORESTS IN SASKATCHEWAN

C. MacFayden, District Forest Inspector.

It is estimated that south of the Churchill river in Saskatchewan there are 32,000,000 acres of forest land unfit for agriculture through being too broken, too light, too rocky, too wet, or for some other reason. This does not include most of the poplar lands in the northern part of the province, which are recognized as frequently of a very high agricultural value when cleared. Of this 32,000,000 acres about one-fifth (somewhat over 6,000,000 acres) has been set aside as forest reserves, and the administration of the timber and other resources on these constitutes a large part of the work with which this office is charged. In addition to the work arising out of the reserves this office is also responsible for the maintenance of a fire-protective organization on all Dominion lands carrying merchantable or potential timber supplies.

Very little land has been withdrawn from the forest reserves as being suitable for agriculture. On the whole the reserve boundaries as they now exist fairly divide the agricultural from the non-agricultural, or forest lands.

The department has in a number of instances during the year, at the request of the owners, given vacant homestead lands in exchange for patented lands within the reserves which had proved unsuitable for agriculture.

Fire Protection.—Like the preceding two years, that under review was, in this province, a very favourable one from a fire-protection standpoint. Owing to the spring being rather backward and drawn-out the dead vegetation of the previous year did not dry out before the new green vegetation came on, and this practically did away with the fire risk at this season. The latter part

of September proved very dry; for a short time numerous fires were running, and the situation became quite critical until again rendered safe by a fall of snow and rain.

During the year there were 107 fires reported, 60 per cent of which occurred on forest reserves. Fifty-four of these, or almost exactly 50 per cent, did not reach 10 acres in size, although the remaining 53 covered some 55,000 acres. It is gratifying to note, however, that only a small part of this (1,334 acres) carried merchantable timber, and more than half of it was grass land, muskeg, and old burn. The greatest loss was the 18,203 acres of young growth burned.

The clearing of land for settlement continued to be the greatest source of fires—almost 50 per cent of the total. Campers were next in order and were responsible for one-third of the total. The railways, which were at one time such a prolific source of fires in Saskatchewan, were in 1922 only minor offenders.

Improvements.—Very fair progress was made in the improvement plan of most of the forest reserves and fire-ranging districts during the year. A decided advance was made in the construction of fireguards, particularly on the smaller reserves and those adjacent to settlements. It is found that by far the greatest proportion of fires originate outside the reserve boundaries, and well placed fireguards reduce the damage to reserve forests and lessen the expenditure for fire-fighting. Eventually it is hoped to have a network of well arranged fireguards covering a number of the reserves, so that at the worst fires can be confined to comparatively small blocks. During the year there were 117 miles of guard ploughed for a width of at least 12 feet, and 52 miles cleared for a width of from 30 to 66 feet.

The lookout system of the district was augmented by the addition of eight towers, two of these being of standard steel construction 80 feet high, and the other six being wooden towers erected by the rangers and varying from 40 feet to 60 feet in height. Several of the latter were erected in the fire-ranging districts. The city of Prince Albert granted authority for the use of the city's standpipe as a central control tower for the Pines and Nisbet reserves. This tower was equipped with an Osborne fire-finder and connected by telephone with each of six towers on the reserves.

During the year the telephone system on the reserves was extended by the addition of 81 miles of line. On Fort à la Corne reserve two five-roomed dwellings were erected during the year, both of these replacing old buildings erected years ago that had outlived their usefulness. In addition to the major projects mentioned, a great many small improvements were made or maintained by the ranger staff.

Grazing.—During the year there were 739 permits issued authorizing the grazing of stock on the different forests. These permits represented a total of 33,189 head of stock, a decrease of approximately 4,000 on the total of last year due to market conditions. The grazing of stock on the co-operative plan by small associations continues to grow in favour, and there are now about thirty of these associations in this inspectorate. Now that the principle is thoroughly established, the time seems ripe to encourage a more intensive application of it, particularly along the line of building up better herds.

Silviculture.—Timber operations under the authority of permits remained about stationary or with only a small decrease as compared with last year, when the volume of this business was the greatest on record. Altogether there were 1,358 permits issued and of this number 823 were paid permits, the dues on which amounted to \$12,890.12. The great bulk of material disposed of in this way was fire-killed in 1919, and its removal, besides benefiting the permittee and constituting a source of revenue, to an appreciable extent lessens the

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fire-hazard. From the latter standpoint the removal of fuel-wood is proving the most satisfactory, as in these operations all sizes and species and a wide range of grades can be taken, and on many cutting areas nothing remains when the operation is completed but the young growth and green material. Cord-wood operations have been particularly encouraged for this reason and a new record was this year created when 35,228 cords were taken out. The cut of building logs, fence-posts, poles, and other material required for farm purposes remained about the same as in previous years, but the logs cut for sawing decreased by over one-half.

The past winter was active in operations on timber sales and the sixteen sales in good standing produced about 6,000,000 feet board measure, in addition to 2,000,000 lath and 2,600 ties. No difficulty was experienced in having the regulations regarding cutting methods and the disposal of debris, complied with.

Planting and nursery work, especially the latter, received very much more attention than heretofore. Small nurseries are now established on the Big River, Nisbet, Pines, Fort à la Corne, Pasquia, Porcupine, Beaver Hills, and Dundurn reserves. A number of these are showing very satisfactory results.

Approximately 90 bushels of jack pine cones were collected in the fall of 1922 and shipped to Indian Head for extraction.

Surveys.—An intensive cover-type survey was made of the larger part of the Nisbet forest reserve, and part of the Pines, Pasquia, and Porcupine reserves. The object here was to secure complete and accurate data on the conditions of the forests as a basis for formulating a timber-sale policy leading up to working plans. The information gained shows what species, age-classes, and mixtures or types exist, and inventories the amounts. It also adds very materially to existing information on the topography of the country covered.

Recreation.—The use made of the various forests as recreation grounds is becoming more general, although no great increase was noted during the year just past. No new summer resorts were laid out, but the Moose Bay subdivision in the Fish Lakes resort on the Moose Mountain forest was thrown open for leasing.

DOMINION FORESTS IN ALBERTA

C. H. Morse, District Forest Inspector

The work of the Forestry Branch in Alberta consists in the protection and administration of the Dominion forest reserves within the province and the protection from fires of forested Crown lands which have not yet been included in the reserves or taken up under homestead entry. In addition there is the enforcement of the fire-prevention requirements of the Board of Railway Commissioners of Canada on all railways within the province coming under their jurisdiction.

There are in this province eight forest reserves, covering an area of approximately 18,690 square miles, which have definitely been reserved for the production of timber and for their beneficial effect on stream-flow. It is the duty of the Forestry Branch to protect them from fire and insect and fungous pests and to administer them in such a way that the stands of timber may be improved and extended by proper silvicultural practice. Timber is sold in increasing quantities each year, but the larger part of such timber has been

fire-killed in previous years and the remainder is mature and over-mature green timber which by reason of its age should be harvested. Very little immature timber is being cut, and that only for silvicultural reasons, that is, for the benefit of the remaining stand. Although forest fires in past years have reduced the areas of mature timber to a very small percentage of the whole, there is reason to hope that present stands, both inside and outside reserves, will be sufficient to meet the demand until the large areas of immature timber at present on the reserves are ready for the market.

Fire Protection.—The past season must be regarded as being exceptional, both from the point of view of fire-danger and from the number and seriousness of the fires which occurred. There can be no doubt that it has been at least as bad as that experienced in 1910, and that year has always been considered as the worst since the Forestry Branch undertook fire protection in this province. In comparing the two years, however, it should be noted that the hazard was much greater in 1922 than 1910 because of the great increase, in the district affected, of settlement, railways, and backwoods travel, which constitute the chief sources of forest fires. Reports were also much more complete in the latter than in the former year.

Of the 1,758 forest fires which burned in Alberta during the season, only 170, or less than 10 per cent, attained a size of more than 10 acres or caused any expense or damage. The 1,588 smaller fires were those discovered and controlled in their incipient stage. That railway fires can be kept down by efficient patrol, engine inspection, and improved right-of-way conditions, is evidenced by the fact that 97 per cent of the 675 railway fires this season were less than 10 acres in extent and caused no damage to timber. The close co-operation which the railway companies have given made it possible to give the larger fires immediate attention so that few of them did any serious damage. The same does not apply to settlers' and campers' fires, however. These occur in remote and rather inaccessible places, are widely scattered, and are apt to attain to large size before fire-fighting operations can be started.

Seventeen persons were convicted during the year, under the provincial Fire Act, of causing forest fires. This has had a salutary effect and tends to build up the body of public opinion necessary for protecting the forest.

Forest Surveys.—The work of mapping the forest cover on Alberta reserves was continued last summer, and was completed on the Crowsnest and Bow River forests. A considerable amount of forest-cover mapping was also done on the Clearwater and Brazeau forests and the Lesser Slave forest reserve. The information already gathered shows that there is a comparatively small quantity of accessible merchantable timber remaining on these reserves. There are, however, large areas which will mature in from twenty-five to fifty years.

Seeding and Planting.—On the Cooking Lake and Cypress Hills forest reserves the seeding and planting work started four years ago has been continued. On these two reserves more than 86,000 spruce and pine seedlings were planted last year, and these, as well as previous plantations, are doing extremely well. This work is now past the experimental stage and it will soon be proceeded with on a much larger scale. Experiments started a year ago with direct seeding on partially prepared ground have been fairly successful, and it is proposed to continue this work until the most suitable method has been found. The seed-beds and nurseries on these two reserves have been doing well, and are now in a position to furnish in the vicinity of 150,000 seedlings a year.

Timber Sales and Permits.—Sales of timber under the authority of timber sales in this district amounted to 9,370,000 feet board measure and 685,000

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lineal feet of mining timber. While the sales of saw material have increased by almost one million feet, the sales of mining timber have fallen off greatly owing to the long period of idleness in the mines caused by the strike during the summer of 1922. It is interesting to note that 2,950,000 feet board measure of the saw material and almost all of the mining material has been cut from fire-killed timber. The remainder of the year's cut was mature or over-mature spruce and pine timber.

Seventeen timber sales were in operation during the year, of which nine supplied small local mills; seven, mining timber for coal mines; and one, railway ties for the Canadian National Railways. The usual requirements of this branch with regard to close utilization and brush disposal have been very satisfactorily carried out in all cases.

Timber cutting under the authority of permits has brought in more revenue than formerly, but there were fewer permits issued than in the preceding year. A considerable quantity of fire-killed timber has been disposed of under permit at a reduced rate of dues, and it is satisfactory to note in this connection that most of the accessible fire-killed timber on the southern reserves has now been salvaged.

Aeroplane Patrol.—This branch has been greatly aided in fire-protection work by the air patrol maintained over the Crowsnest, Bow River, and Clearwater forests through the co-operation of the Air Board. Though the larger number of fires that have occurred in this area were in the more accessible parts of the reserves and were discovered almost at once by the ground patrol, in several instances aeroplane patrol was the detection medium, and in these cases very rapid control was made possible by the pilot's action. These fires would have attained large proportions but for quick action in fighting them.

Two patrols were carried out almost daily during the summer, one going south over the forest reserves and Waterton Lakes park to the International Boundary and one going north to the North Saskatchewan river. These outgoing patrols were made in the morning, the machines landing at temporary aerodromes at Pincher Creek and Eckville for a few hours and returning in the afternoon to the High River aerodrome. Special photographic work for mapping of rivers, timber, and roads was carried out several times with very good results.

It is impossible to overestimate the importance of the daily aeroplane patrol maintained in this district. This lies in the fact that the area covered each day includes all the less accessible portions of the reserves, thus enabling the ranger staff to concentrate on the most dangerous points and attend to other work necessary to the proper administration of the reserve. The effect of the patrol on campers and fishermen, of whom there are large numbers on the area covered, is excellent. Leaflets containing a warning to the public concerning the danger of forest fires have been dropped over fairs and sports held in different parts of the province.

Improvements.—During the year considerable progress was made in completing the improvement programme on the forest reserves. The structures erected included cabins, barns, granaries, one lookout station, besides smaller buildings.

The trail system has been greatly extended during the past season, and a large area has been opened up for easier travel and more efficient patrol. In all, some 230 miles of trail were built, mostly on the northern reserves. About 33 miles of telephone line were constructed, the larger part of which was in the Bow River forest. Emergency landing grounds for aeroplanes were constructed

on the Bow River and Crowsnest forests, and about six miles of fireguard along dangerous sections of railway line.

Grazing.—By the application of forest-reserve regulations, attempts have been made with encouraging results to introduce proper range management. The effect of this, as worked out with the co-operation of the grazing associations, has been to considerably conserve the forage in recent dry seasons. Permits issued during the summer season amounted to 586, approximately the same number as in 1921, covering 26,062 cattle, 8,106 horses, and 1,197 sheep. Winter-grazing permits were issued for 1,790 cattle and 2,600 horses. Grazing during the winter is not encouraged, but was deemed necessary last season owing to local and seasonal conditions. Although the stock, in a great many cases, was put on the range in the spring in poor flesh, they left the reserve in very good condition.

Increased use will likely be made of the northern forests, as many inquiries are being received as to grazing possibilities in these more remote areas. The northern districts will support many thousand head of stock, and from a forestry standpoint increased grazing will have a decided effect on the reduction of the fire-hazard produced by unconsumed forage.

DOMINION FORESTS IN BRITISH COLUMBIA

D. Roy Cameron, District Forest Inspector

In British Columbia the area under the administration of the Dominion Forestry Branch is confined entirely to the "Railway Belt."

Fire Protection.—The Railway Belt was again subjected to a fire season of abnormal severity, probably the worst it ever experienced. For several seasons past very severe weather in the autumn has been followed by very light snowfall in the winter. These conditions resulted in rapid run-off in the spring, causing the forest floor to become extremely dry, with a resultant period of high hazard before the new vegetation appeared.

The number of fires fought and extinguished during the season reached a total of 589. This was an increase of 144 fires over the previous year, 167 over 1920, 181 over 1919 and 300 in excess of 1918. The protective organizations were very severely tried, but, despite the continued strain on both staff and equipment, every fire was successfully handled.

The proportion of "large fires" reached 55 per cent of the total. This designation includes any fire, no matter how small, where expense is incurred. The total area burned over was 109,474 acres, which included old burns, slash areas, and merchantable and young timber. The area of merchantable timber burned totalled 42,502 acres, the area of young growth, 54,735 acres; the remainder was old burn, slash, etc. The loss of merchantable timber also showed a considerable increase over last season, but was much lower than for 1920—47,447,000 feet board measure in 1922, against 13,956,000 feet board measure in 1921, and 148,000,000 feet board measure in 1920. The reason for the marked decrease in comparison with the figures for 1920 is that the protective organizations have been brought to a state of higher efficiency since that season.

It is a disconcerting fact that during the past season fires attributed to incendiary causes reached a total of 101 out of a grand total of 589 from all

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causes. Railways, however, with a total of 204, contributed the largest number of fires for the season. The majority of these fires were small and many not over a quarter of an acre. The efficiency of fire protection along railways and of railway co-operation is shown by the fact that in all the large number of outbreaks only seven fires reached the proportions of ten acres and over.

Fires from causes unknown come third in number with a total of 82, or a percentage of 13.92. A large proportion of unknown fires occurred along railway rights of way. These totalled 53, and the unknown fires for other areas, 29. Settlers come fourth on the list with 66 fires, or 11.2 per cent, the highest since 1919. Fires from lightning were comparatively few, with only 55, or 9.33 per cent; these were chiefly confined to the higher mountainous regions of the Revelstoke district. The remainder of the fires were attributed to various causes, of which campers and smokers contributed the most.

Improvements.—To complete the work started during the season of 1921, two lookout stations were finished and put in operation. The reserve area is now completely under observation as far as primary lookouts are concerned, and any further work in this connection will be undertaken with the object of occupying positions which will overlook areas of extreme hazard and great forest values and make primary points still more effective. Maintenance work was carried out on trails and buildings at various reserve headquarters.

In the Salmon Arm fire-ranging district work was completed on the installation of a lookout on Mara mountain, elevation 7,201 feet above sea-level. This mountain is the highest point on the Hunter's range, and is reached by a new trail from Sicamous 15 miles in length.

Work was commenced on the installation of the first lookout in the Revelstoke district, which is located on the summit of Cartier mountain at an elevation of 8,623 feet above sea-level. It overlooks the entire lower Columbia River valley and adjacent country. With the ten miles of trail and the nine miles of telephone line completed the lookout will be installed ready for use early in the 1923 season.

In the Coast district the only improvement work undertaken was the reconstruction of part of the Chilliwack River telephone line. Other minor improvements were undertaken by the regular staff.

Silviculture.—During the season of 1922 a forest-cover and topographical map of the Larch Hills forest reserve was completed, and an exhaustive study was made of the various timber types. Many sample plots were laid out in various types and locations. A few plots were laid out on cut-over areas as a means of studying results from possible silvicultural systems of cutting timber.

Timber-sale business suffered considerably from the general economic conditions; but towards the close of the fiscal year many inquiries were received and a number of sales made. Timber-permit business was stationary.

The season of 1922 was a poor year for the collection of tree seed. From the surplus supply of 1921 a large amount of seed was shipped to the United States and smaller amounts were forwarded to various points in Europe, Australia, and New Zealand. Douglas fir seed seems to be in demand for American and European markets, as is also Sitka spruce to some extent. Shipments to the British Government were small owing to the curtailment of expenditure in the forestry activities in Great Britain.

Insects.—Operations were brought to a conclusion in what was known as the Spius and Prospect Creek insect control. The main stand of yellow pine in this area has now been gone over with the result that insect depredations have been reduced from epidemic conditions to an endemic state. About 550 trees, totalling some 250,000 feet board measure, were cut and destroyed.

Recreational Uses of Forest Reserves.—Both Trout lake and Paul lake again drew their quota of tourist and summer-resort patronage. The main attraction is, of course, the trout fishing and it is regretted that Trout lake shows a falling off in the number of fish landed. The catch in Paul lake increased. The main reason for this is that Paul lake has better spawning facilities and has a much better natural situation to withstand drought conditions. In co-operation with the Department of Marine and Fisheries a small hatchery was installed on the main stream flowing into Paul lake which it is expected will improve conditions. The demand for camping permits and summer resort lots was greater than could be met during the past season.

FOREST PRODUCTS LABORATORIES OF CANADA

W. Kynoch, Superintendent

The period now under review was marked, as was the year 1921-22 by a considerably augmented demand for the services of the laboratories on the part of the industries and the public. The investigative and demonstration work carried out in the semi-commercial paper-mill was more extensive than in any year since its installation, while the research and allied work of the laboratories generally was greater in variety and amount than in any previous year since their inception.

A brief review of the main lines of investigation is given below:—

Sulphite Pulp from Jack Pine.—Object: to develop a process of sulphite cooking which will yield a pulp of high quality free from resin. The attempt was first made to eliminate resin by the use of cymene as an extracting medium. The results were unsatisfactory and the problem was next approached by careful manipulation of the cooking conditions. A material improvement was effected in the quality of the pulp. Further laboratory work, however, remains to be done.

Freeness as a Control Test in Ground-wood Production.—Object: to determine the feasibility of applying the freeness test as a control in ground-wood production. The adaptability of this test to control work was investigated very thoroughly with promising results. The investigation included work under commercial conditions at a paper-mill and arrangements have been made to do similar work at three other mills with a view to substantiating results obtained.

Determination of the Burning Temperature of Exposed Chips in Sulphite Cooking.—Object: to determine the maximum temperature to which spruce and balsam fir chips may be raised, before being covered with acid, without injury to the chips. The critical temperature was determined and the work successfully completed.

Pulping Qualities of Fire-killed Wood.—Object: to determine the effect of fire-killing and superficial charring on the pulping qualities of spruce and balsam fir. The work was concluded and indicated that the fire-killed material, of which large quantities exist in certain districts, can be successfully used for pulp manufacture by the sulphite process.

Chemical Research on Cellulose.—Object: to add to the knowledge of the constitution of the cellulose molecule and of the chemistry of the cellulose complex of Canadian woods generally. Attention was given chiefly to the investi-

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gation of the chloral condensation products of cellulose on which a good deal of research work was done. The subject is a complex one and the investigation will be continued.

Refining of Waste-paper Stock.—Object: to develop the best method of recovering good paper stock from the condemned paper currency withdrawn from circulation by the Department of Finance, and to ascertain if this method can be profitably practised on a commercial scale. Refining of the stock produced under normal cooking conditions was carried out and, by the use of a special washing equipment, it was found possible to recover an absolutely clean pulp. The work will be continued on a commercial scale.

Preparation of Reference Collection of Microscopic Slides of Woods.—Object: to build up a collection of authentic microscopic slides of the important commercial timbers of the world and of photomicrographs illustrative of anatomical features. The work was continued from the preceding year and all Canadian timbers of any commercial importance have now been dealt with, together with a number of the more widely used foreign timbers. The work will be continued.

Ply and Laminated Construction.—Object: to extend the field of application of the built-up type of construction. Attention was first given to sporting goods of which large quantities are imported into Canada. A laminated ski and a built-up tennis racquet were developed, service tests of the former carried out and those on the latter begun. The results were decidedly encouraging and commercial production on a small scale is expected.

Kiln-drying.—Object: to investigate the scientific principles involved in kiln-drying and to improve present kiln-drying practice. A field study of kiln-drying practice at Canadian wood-working factories was begun and will be continued.

Water Storage of Ground-wood Pulp.—Object: to determine whether the decay which frequently occurs in stored pulp can be prevented by storage in water. Ground-wood pulp secured from various pulp-mills has been stored in water for periods varying from two to three years. Paper made from these pulps was tested and compared with paper made from similar pulps newly manufactured and the results demonstrated that pulp can be stored under water for considerable periods without deterioration. Commercial trials are to be undertaken.

Decay of Timber in Buildings.—Object: to secure exact information as to the conditions which facilitate the action of various wood-destroying fungi on woods used for interior construction in mills, factories, etc., and to work out procedure and methods by means of which the decay can be prevented. The work has been in progress for some years, and expert technical knowledge on the prevention of decay has been secured as a result of decay studies in some hundreds of large buildings, a number of which were examined during the year. A special publication on the subject is being prepared.

Mechanical and Physical Properties of Woods Grown in Canada.—Object: to determine, by means of an exhaustive series of mechanical and physical tests, the strength functions of Canadian commercial timbers. Data have now been obtained for practically all Canadian timbers of any commercial value, but much work remains to be done before figures can be considered complete.

Glued Joints.—Object: to investigate the effectiveness of glues of the various classes for joint work. Some twenty-six commercial adhesives of the

hide and casein classes were investigated during the year, the work including both mechanical tests on joints and physical determinations on the adhesives. Ageing tests to secure information on the permanency of the adhesives were also undertaken.

Retention of Nails by Various Woods.—Object: to ascertain the relative ability of various woods to retain nails. Some six hundred tests were made with the specially designed equipment installed last year. Nails were of various types, such as cement-coated, barbed, etc. The work will be continued until all Canadian commercial woods have been covered.

Comparative Strength Values of Canadian Woods for Tie Purposes and Telegraph Top Pins.—Spike-retaining tests were made on cedar, spruce, and jack pine ties. The effect upon retention of driving into bored holes as compared with solid wood was carefully investigated, special attention being given to the effect of varying the diameter of the bored holes.

The strength of telegraph top pins of Canadian birch, beech, and maple was compared with that of top pins of imported woods. Results demonstrated that the Canadian hardwoods possessed ample strength for the purpose.

Creosote Treatment of Hard Maple for Railway Ties.—Object: to work out a satisfactory method of creosote treatment of this wood for tie purposes and to establish service tests in track. Maple proved to be a most erratic wood as regards penetrability with creosote oil, some material being very readily penetrable and some extremely refractory. Extensive work was done on treatment and a reasonably satisfactory method was finally worked out.

Creosote Treatment of Aspen for Railway Ties.—Object: to work out a satisfactory method of seasoning and of creosote treatment of this wood for tie purposes. The investigation is a preliminary one only, but it is believed that, by means of the incising process, the wood can be successfully and economically treated.

Preservative Treatment of Canadian Hardwoods for Top Pins and Pole Brackets.—A considerable amount of work was done both at the laboratories and at a plant manufacturing the accessories, and a satisfactory open-tank treatment was worked out.

Other investigations conducted included the determination of the sulphite pulping qualities of water-killed spruce; the development of a method of utilizing ground-wood screenings; the analysis of paper-fibres; the study of the relation of the rate of growth to the strength of several Canadian woods; the effect of red stain in jack pine; the chemistry and specifications of creosote oils, tars, and creosote-tar mixtures; and the treatment of woods to render them fire retardant.

Exhibits.—The collection and preparation of exhibits of forest products and articles manufactured or derived therefrom was continued and a number of additions made to the permanent exhibit at the laboratories. Exhibits were prepared also for the use of other Government offices and for display in public places.

There was a brisk demand for hand-specimens of Canadian woods. A new supply of sets was prepared, and a considerable number distributed in response to requests from educational institutions and others in Canada and abroad.

Library.—The reference library, which deals with the technology of woods, the products therefrom, and related matters, was materially extended and improved.

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Information Furnished.—The supplying of technical information in answer to inquiries relating to woods, their identification and to products manufactured or derived from woods is an increasingly important function of the laboratories. Well over five hundred such inquiries received attention during the year, a greater number than in any previous year.

Publicity.—A number of technical articles and news items were prepared during the year by members of the staff and published in Canadian and other periodicals or newspapers. The bulletin on the distillation of hardwoods, which was prepared last year, appeared in print and has been much in demand. A number of lectures and addresses were also given before scientific and technical societies.

TABLE I—STATEMENT OF REVENUE, FORESTRY BRANCH, FISCAL YEAR ENDED MARCH 31, 1923

Reserve	Timber sales	Timber fees and dues	Timber seizures	Grazing permits and trespass	Hay permits and seizures	Surface rentals	Special uses	Nursery stock	Unclassi- fied	Total
	\$ cts	\$ cts	\$ cts	\$ cts	\$ cts	\$ cts	\$ cts	\$ cts	\$ cts	\$ cts
Turtle Mountain		290 30	54 78	2,608 20	571 00	77 60	18 00			3,619 88
Spruce Woods		102 00		629 00	151 75					882 75
Riding Mountain	246 00	6,790 57	277 15	536 35	843 50	491 40	669 00			9,853 97
Duck Mountain		2,708 66	30 06	372 36	353 75	384 90	26 00			3,875 73
Moose Mountain		549 55	16 06	573 60	356 75	131 00	585 25			2,212 15
Beaver Hills		210 65	26 50	315 67	148 25		9 00		132 25	842 32
Porcupine	1,382 60	1,274 47	66 75	699 83	464 50		280 30			4,168 45
Pasquia	18,707 86	3,380 26		31 36	181 25		76 00			22,376 73
Fort à la Corne	657 27	1,439 11	83 34				1 00			2,180 72
Pines	67 20	2,495 95		513 30	62 75		39 00			3,178 20
Nisbet		1,709 53	96 00	242 53	36 50		88 25			2,172 81
Big River		39 15		808 95	341 59		45 00			1,234 69
Steep Creek										
Sturgeon		186 04	12 25	261 54	82 25		28 60			570 68
Keppel		140 50	3 00	781 60	14 50		13 00			952 60
Manito		371 40		2,394 74	71 25		49 00			2,886 39
Dundurn		93 50		426 35	77 75		10 00			607 60
Seward				610 64	45 75		26 00			682 39
Elbow		40 50	5 00	982 55	48 00	83 32	47 00			1,206 37
Big Stick				6,218 76			55 00			6,273 76
Cypress Hills		1,992 78	95 54	3,884 07	3 50	34 95	17 00			6,027 84
Cooking Lake		19 50		1,510 10	199 25		2 00			1,730 85
Crowsnest	4,320 63	2,700 62	50 24	8,564 93	13 00	28 20	338 50			16,016 12
Bow River		3,546 46	40 00	6,068 13	55 75		65 15			9,775 49
Clearwater	5,051 97	208 63		424 72	12 00	560 32	198 00			6,458 64
Brazeau	5,658 17	2,136 56	705 59	56 14		830 34	236 00			9,622 80
Athabaska	5,001 19	2 00		75 76	31 00		148 00			5,257 95
Lesser Slave	15,352 15			21 64	174 75		11 00			15,559 54
British Columbia Reserves	515 00	120 60		15 50	123 00	225 25	147 00	1,314 30	730 41	1,146 35
Indian Head										2,044 71
Head Office	412 75									442 75
Totals	57,405 79	32,549 29	1,562 20	39,628 32	4,463 34	2,847 28	3,228 05	1,314 30	862 66	143,861 23

TABLE 2—STATEMENT OF TIMBER PERMITS ISSUED IN FOREST RESERVES, FISCAL YEAR ENDED MARCH 31, 1923

Reserve	No. of permits		Kinds and quantity of timber authorized to be cut										Dues and fees \$ cts.
	Free	Paid	Poles or rails	Fence- posts	Saw- timber Ft. B.M.	Railway ties	Mine timber Lin. Ft.	Lath Pieces	Building logs Lin. Ft.	Fuel green	Fuel dry		
										Cords	Cords		
Turtle Mountain.....	2	42		2,200	24,200					960	321	290 30	
Spruce Woods.....		24									117	102 00	
Riding Mountain.....	120	624		13,377	1,900,363				40,057	521	9,221	6,790 57	
Duck Mountain.....	50	220	3,000	5,067	2,699,323				16,961	221	894	2,708 66	
Moose Mountain		114		4,775					1,580	273	393	549 55	
Beaver Hills	5	35							10,180	92	87	210 65	
Porcupine.....	35	69	800	24,563	1,460,614				13,010	10	864	1,274 47	
Pasquia.....	10	118		4,700	101,700	90		434,000	6,044	312	8,265	3,380 26	
Fort à la Corne	45	185		13,088	142,480	70			27,267	27	5,431	1,439 11	
Pines.....	5	135	3,050	17,764		2,800			10,496	100	7,159	2,495 95	
Nisbet.....	16	227	6,330	9,790	11,000				6,180		8,304	1,709 53	
Big River.....	6	4		200					9,455		74	39 15	
Steep Creek													
Sturgeon.....	9	13	600	1,800	103,150				6,818			186 04	
Keppel.....	4	42	270	400					5,800	52	97	140 50	
Manito	18	103	1,550	5,685					6,780	256	211	371 40	
Dundurn.....		22								133		93 50	
Elbow.....		26								2	67	40 50	
Cypress Hills	86	557	42,097	48,955	202,300				49,191	1,145	2,184	1,992 78	
Cooking Lake	2	5		7,000					300		47	19 50	
Crowsnest.....	108	223	17,179	7,966	921,000		300		265,085	3	2,579	2,700 62	
Bow River.....	13	99	17,318	5,525	15,500				290,176		4,774	3,546 46	
Clearwater.....	42	26			1,011	1,369			9,506		1,058	208 63	
Brazeau.....	9	24			150,000		1,533,547		69,647		269	2,136 56	
Athabaska.....	2										50	2 00	
British Columbia Reserves	7	14	1,000	600		2,500			11,100	53	94	120 60	
Totals	594	2,951	93,194	173,515	7,732,641	6,829	1,533,847	434,000	856,593	3,200	52,560	32,549 29	

TABLE 3—STATEMENT OF GRAZING PERMITS ISSUED IN FOREST RESERVES, FISCAL YEAR ENDED MARCH 31, 1923

Reserve	No. of permits	Number of Stock				Dues and fees collected
		Cattle	Horses	Sheep	Total	
						\$ cts.
Turtle Mountain.....	98	1,406	195	1	1,602	2,608 20
Spruce Woods.....	20	267	59		326	629 00
Riding Mountain.....	59	973	82		1,055	469 15
Duck Mountain.....	12	529			529	273 06
Moose Mountain.....	40	878	87		965	560 60
Beaver Hills.....	38	509	82		591	315 67
Porcupine.....	43	1,177	69		1,246	642 03
Pasquia.....	6	47	10		57	31 36
Fort à la Corne.....						
Pines.....	29	1,199	76		1,275	513 30
Nisbet.....	18	544	11		555	242 53
Big River.....	5	530	26		556	808 95
Steep Creek.....						
Sturgeon.....	15	456	56		512	261 54
Keppel.....	31	1,134	314		1,448	675 60
Manito.....	111	3,663	773	25	4,461	2,220 42
Dundurn.....	23	718	181		899	426 35
Seward.....	24	350	292		642	610 64
Elbow.....	108	1,464	605	500	2,569	982 55
Big Stick.....	253	9,169	2,336	7,700	19,205	6,070 76
Cypress Hills.....	148	4,961	2,215		7,176	3,842 57
Cooking Lake.....	114	1,245	1,219		2,464	1,427 60
Crowsnest.....	263	13,391	3,749		17,140	8,564 93
Bow River.....	126	8,608	3,368		11,976	6,068 13
Clearwater.....	49	305	242		547	424 72
Brazeau.....	12	7	89		96	56 14
Athabaska.....	7	6	75		81	75 76
Lesser Slave.....	1	38	4		42	21 64
British Columbia Reserves.....	5	50			50	15 50
Totals.....	1,658	53,624	16,215	8,226	78,065	38,838 70

TABLE 4—STATEMENT OF TIMBER CUT ON FOREST RESERVES UNDER AUTHORITY OF TIMBER SALES, FISCAL YEAR ENDED MARCH 31, 1923

Reserve	Previ- ous sales still oper- ating	Sales made current year	Saw- timber	Mine Timber				Rail- way ties	Tele- phone poles	Dues collected
				Props	Props	Lagging	Lagging			
			Ft. B.M.	Ft. B.M.	Lin. Ft.	Cords	Ft.B.M.	Ft.B.M.	Lin. Ft.	\$ cts.
Riding Mountain.....		1								
Pasquia.....	4	3	7,853,384			477				28,480 43
Porcupine.....	3		1,066,849							4,333 64
Fort à la Corne.....		3	43,511							65 27
Pines.....		1								
Athabaska...	1		1,516,458							4,928 49
Crowsnest.....	1	2	3,086,239							4,629 35
Clearwater.....	2	2	172,019	1,473,428		318	149,162			5,176 49
Brazeau.....	2	2	2,495,500	193,866			261,726			6,314 11
Lesser Slave.....	1		4,698,278							12,423 68
British Columbia Reserves.....	5	2							2,790	22 55
Totals.....	19	16	20,932,238	1,667,394		795	410,888		2,790	66,374 01

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TABLE 5—STATEMENT SHOWING QUANTITY OF TIMBER SOLD AND REVENUE DUE
FISCAL YEAR ENDED MARCH 31, 1923, ON LICENSED TIMBER BERTHS WITHIN
DOMINION FOREST RESERVES

MANITOBA

Reserve	Timber berths	Area in reserve	Quantity sold			Revenue		
			Lumber	Lath	Other products*	Dues payable	Rent payable	Total payable
	No.	Sq. Mls.	Ft.B.M.	No.		\$ cts	\$ cts.	\$ cts
Riding Mountain...	2	22.75	.	.	.	.....	227 50	227 50
Duck Mountain.....	11	107.59	.	.	.	.....	1,075 90	1,075 90
Totals.....	13	130.34	.....	.....	.....	.....	1,303.40	1,303 40

SASKATCHEWAN

Porcupine and Pas- quia	41	850.22	48,777,908	17,339,788	2,991,093	45,676 45	8,502 20	54,178 65
Nisbet and Pines....	4	80.69	185,537	.....	5,445	1,559 36	173 15	1,732 51
Totals.....	45	930.91	48,963,445	17,339,788	.....	47,235 81	8,675 35	55,911 16

ALBERTA

Crowsnest.....	11	234.92	8,741,308	2,530,200	757,543	12,601 98	2,349 20	14,951 18
Bow River.....	13	275.99	5,724,024	.	1,255	4,165 86	2,759 90	6,925 76
Clearwater.....	4	371.52	160,760	.....	139,337	8,310 98	3,715 20	12,026 18
Brazeau.....	11	163.85	.	.....	77,797	5,597 62	1,638 50	7,236 12
Totals.....	39	1,046.28	14,626,092	975,932	30,676 44	10,462 80	41,139 24

BRITISH COLUMBIA

Totals.....	11	128.32	6,788,694	189	6,818 97	1,283 20	8,102 17
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ALL DOMINION FOREST RESERVES

Grand Totals.....	108	2,235.85	70,378,231	3,972,659	84,731 22	21,724 75	106,455 97
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* The figures in this column indicate the number of units on which dues were calculated. They include 8,757 cords of fuel-wood, 5,260 telephone poles, 150 cords of shingles, 334 cords of slabs, 754,300 mine-props, 239,226 railway ties, 15,267 fence-posts, 45 cords of pulpwood, 1,064 rails.

PART IV

RECLAMATION

REPORT OF THE DIRECTOR OF THE RECLAMATION SERVICE, E. F. DRAKE

IRRIGATION

The series of dry years, from which the semi-arid districts of Alberta and Saskatchewan have recently suffered, has been responsible for widespread requests for surveys to ascertain what areas can be irrigated from the available water supply, and the staff of the Reclamation Service, whose duty it is to make these investigations and surveys, has had difficulty in keeping up with the demand.

CLIMATIC AND CROP CONDITIONS IN SOUTHERN ALBERTA IN 1922

The month of November, 1921, was unusually mild and there was practically no snowfall. Stock on the range was therefore in excellent shape to withstand the cold weather which came in December when, because of heavy snowfalls, considerable feeding was necessary. Mild weather prevailed throughout January, February, and part of March, and all stock came through the winter in good condition. April was cold and wet, and the land was too moist for ploughing. May, however, was warm, and good progress was made in agricultural operations. During June the temperature was about normal and the precipitation was the highest since 1916. Rain fell at intervals of a few days all through the month, and the amount and distribution of this moisture gave the crops a splendid start. July, August, and September were warm and dry with some hot winds, but the moisture remaining in the ground from the June rains carried the crops through to a fairly successful harvest.

The total precipitation in 1922 was below the average, but the occurrence of heavy rains at the proper time—April, May, and June—and the absence of drying southwest winds, were conditions directly responsible for the better crop yields; this is a striking instance of distribution of rainfall being more important than amount.

IRRIGATED CROPS

Because of the abundant rainfall in the early part of the season, irrigation was not so urgently needed as in the last few years; notwithstanding this, a larger number of acres than ever before were irrigated on the large projects, by about the same number of water users. There has always been a tendency to delay using water in the hope that there would be sufficient rainfall, and crops on irrigable land have frequently suffered on this account. This year's record indicates that the farmers are depending less upon the weather and more on their own efforts. The returns from the different projects under operation show that irrigated crops were good and the production and value in every case exceeded that of 1921, although prices were low.

PROGRESS IN IRRIGATION DEVELOPMENT

Corporation Projects.—All projects have been successfully operated during the year. As usual some mishaps and unavoidable accidents have occurred, but repairs were quickly effected, and no serious delays in the delivery of water have been reported. Large sums of money have been spent during the year on the repair, betterment, and renewal of canal systems. New telephone lines and fences have been built, hundreds of miles of canals and distributaries cleaned out, and all canal systems are in excellent shape for the season of 1923.

On account of the stringent financial conditions existing all over the world, settlement in those projects, which still have land to sell, remains slow. The majority of settlers in these tracts have come from outside points, but this year a tendency was noticeable among the farmers in Alberta and Saskatchewan to leave their "dry" farms and take up irrigated lands. Many, who have tried irrigated farming for a few years, find that they took up too much land and are now reducing their holdings in order to farm the remainder more intensively.

Irrigation Districts.—Steady progress has been made in this form of development, under which all co-operative irrigation systems will probably be constructed in the future. The Irrigation Districts Act, enacted by the province of Alberta in 1915 and amended from time to time, has functioned efficiently, and the creation of an Irrigation Council to exercise supervision over the organization, construction, and general welfare of irrigation districts, has been a great factor in the smooth working of the Act.

Eight districts, containing a total of 212,000 irrigable acres, have been organized under the Act. One of these, the Taber district, has been in operation for two years; two, the Lethbridge Northern and United districts, have just completed construction; two, the Little Bow and New West districts, are under construction; and at least two more, the Magrath and Mountain View districts, appear likely to complete organization and proceed with construction in 1923.

As mentioned in last year's report, it is evident to close students of agricultural problems, that many of the individual holdings in irrigation districts are too large to be properly cultivated under irrigation, largely because of the high cost of the necessary work and the inexperience of many of the settlers. In order to achieve success in irrigation farming, especially when the cost of the works is high, every acre must be carefully cultivated and made to yield good returns. Generally speaking, the average farm unit should contain from 80 to 160 acres of irrigable land, while the holdings usual for "dry farming" in this country are very much larger. The Colonization Branch of the Irrigation Council, organized by the province of Alberta in 1921, has been busily engaged in remedying this difficulty. It has listed the excess land holdings to be disposed of by farmers and has carried on an active colonization campaign for the purpose of selling these lands and placing additional settlers on them. Efforts in this direction have so far been largely confined to the newly completed Lethbridge Northern irrigation district. A few sales have already been effected, and if the enquiries received and the interest shown are any guide, quite a number of settlers should be placed in this district during 1923.

In Saskatchewan many small irrigation schemes are being operated, but no large co-operative projects have yet been developed. An Irrigation Districts Act, very similar to that of Alberta, was passed in 1920, but has not yet been used. One project has, however, been surveyed and an irrigation district is in process of organization. The Act will therefore probably be brought into practical operation at an early date.

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Small Irrigation Projects.—The construction of small individual projects continues to interest many farmers whose lands can be irrigated by diversion from nearby streams, and the waters of some of these streams have been practically all appropriated. Some of these small projects have been operated successfully for many years and there are at present 496 licensed or authorized schemes. These, with other schemes not yet authorized and a large number of new applications recorded in 1922, make a total of 724 small irrigation projects under the supervision of the Reclamation Service.

IRRIGATION IN 1922

During 1922, 241,616 acres were irrigated by 2,937 water users in the five large projects now in operation, a satisfactory feature of the season's work being the improvement in the methods of irrigating with consequent increased crop returns. The percentage of wheat to other crops is still far too high, although it is being reduced year by year as diversified crops gain in favour. Wheat crops exhaust the fertility of the soil sooner than most other crops, and do not give by any means the greatest return per acre. For instance in a certain district wheat gave a return of slightly over \$20 per acre, whereas in the same district alfalfa yielded almost \$50 per acre on the average.

The acreage under irrigation will be largely increased in 1923, as two districts, the Lethbridge Northern of 105,000 acres, and the United of 26,000 acres, have just been completed. These districts are well settled and their development should be rapid.

The preliminary surveys for practically all projects, large or small, were made by the Reclamation Service in pursuance of the policy of the Dominion Government that the surface water it controls shall be so allocated as to serve the public to the best advantage. In addition to the seven constructed schemes, surveys have been completed for fifteen other projects which have been found feasible and are now in different stages of organization. Surveys are now being carried on in several new projects.

DUTIES OF THE IRRIGATION DIVISION

It is the duty of the Irrigation Division of the Reclamation Service to administer the surface water supply (with the exception of water powers) in the Prairie Provinces. This is done under the provisions of the Irrigation Act and includes the use of water for domestic, municipal, industrial, irrigation, and other purposes. To administer the water supply so that the greatest benefit may result to the public is a heavy responsibility and a large staff of engineers and helpers is needed to deal with the many different phases of the work. Because of the ever-increasing demands for irrigation the work has been growing heavier each year. The work to be done comprises:—

- 1 Inspection and surveys of small schemes, new or in operation.
- 2 Supervision of large projects under construction or in operation.
- 3 Duty of water experiments and climatic studies.
- 4 Soil surveys and experiments and seepage investigations.
- 5 Surveys of large projects consisting of development of reservoir sites, reconnaissance and preliminary surveys, followed by plane-table and final surveys when projects are found to be feasible.

These surveys and investigations of various kinds were carried on at a number of different points through southern and central Alberta, and south-western Saskatchewan in 1922. Good progress was made during the season, and afterwards in the office the engineers and draughtsmen were employed in

preparing plans of work done in the field and making the necessary designs, studies, and cost estimates of the different projects.

The following schedule shows the development of irrigation to the end of 1922:—

IRRIGATION DEVELOPMENT IN WESTERN CANADA

Project	Source of supply	Area of tract	Irrigable area	1922 Operations		Capital cost	Mileage of canals
				No. of water users	Area irrigated		
		acres	acres		acres		
Constructed and in operation—							
C.P.R. Western Sec.....	Bow river.....	1,145,336	218,980	967	49,752	\$5,353,440	1,469
C.P.R. Eastern Sec.....	Bow river.....	1,212,074	400,000	893	93,375	11,132,169	2,500
Alberta Ry. & Irr. Co.....	St. Mary river.	434,509	130,000	865	75,558	1,900,000	225
Taber Irr. district.....	St. Mary river.	30,365	17,244	128	13,122	272,330	73
Under construction, partly in operation—							
Canada Land & Irr. Co.....	Bow river	452,482	202,640	64	9,809	6,541,207	377
Constructed, operation to commence 1923—							
Lethbridge Northern district..	Oldman river..	231,220	105,000			5,400,000	
United Irr. district.....	Belly river	64,600	26,000			524,000	
Little Bow district.....	Highwood river	11,490	3,278			36,000	
Found by surveys to be feasible (district organized)—						Estimated cost	
New West district.....	Bow river.....	13,015	4,501			160,000	
Medicine Hat E. Irr. district	Ross creek.....	4,800	2,900			36,000	
Macleod Irr. district.....	Waterton river.	108,603	49,649			2,060,000	
Found by surveys to be feasible (not organized)—							
Eyremore district.....	Bow river	18,776	4,100			250,000	
River Bow Irr. district.....	Bow river	16,688	5,792			314,357	
Lethbridge Southeastern district	Waterton, Belly, St. Mary, and Milk rivers...	1,182,781	414,400			16,622,000	
Robsart-Vidora project.....	Frenchman riv	14,000	10,000			343,841	
Retlaw-Lomond Irr. district.	Bow and Oldman rivers....	418,630	115,000			2,500,000	
Champion Irr. district.....	Highwood river	184,860	50,000			2,071,000	
Granum Irr. district.....	Willow creek....		4,500			260,000	
Beaver Creek project.....	Beaver creek....		9,000			450,000	
Preliminary surveys—							
N. Saskatchewan Irr. project.	N. Sask., Clearwater, Raven and Red Deer rivers.....	3,538,760	1,400,000				
493 small private schemes			114,089				

WATERWAYS TREATY

Provision is made in Article 6 of the Waterways Treaty between Great Britain and the United States for the division between Canada and the United States of the waters of St. Mary and Milk rivers and their tributaries, in the state of Montana, and in the provinces of Alberta and Saskatchewan. This is done in such a manner as to recognize to some extent the prior appropriations from these streams in the respective countries, and to ensure approximately equal division of the waters, it being stipulated, however, that more water may be taken by one country from one stream and less from another without affecting the substantially equal division of the total flow.

The various details affecting the proper interpretation of Article 6 have been considered at a number of meetings of the International Joint Commission, held between 1915 and 1921. In the meantime and pending the issuance of a definite order it was necessary to provide for some method of dividing the waters of these streams, so that irrigation development might proceed without serious hindrance. On May 24, 1918, therefore, the commission issued an interim order describing in considerable detail the methods to be followed in measuring and apportioning the waters of these streams and their tributaries during the irrigation season of that year. This order was found to be satisfactory as a temporary expedient and was renewed in 1919, 1920, and 1921.

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Under these interim orders the Reclamation officers of Canada and the United States have made measurements of stream flow and apportioned the waters as was found necessary from time to time. No serious difficulties were encountered, but it soon became apparent that no large irrigation development would be possible in either country until the proportion of stream flow to be permanently assigned to each was definitely fixed. This was particularly the case in southern Alberta where surveys carried on by the Canadian Reclamation Service had demonstrated the feasibility of irrigating a considerable additional area of land by the utilization of all the available stream flow and the conservation of flood flow.

In September, 1921, meetings were held by the International Joint Commission at Chinook, Montana, and Lethbridge, Alberta, primarily for the purpose of giving locally interested persons an opportunity of presenting their views, and following these hearings the commission at its next regular meeting at Ottawa on October 4, 1921, gave an order which for all practical purposes may be regarded as finally settling the division of flow of these streams between the United States and Canada.

The measurement and apportionment of stream flow was carried out during 1922 under the provisions of the order of October 4, just referred to. As in previous years, an engineer of the Reclamation Service acted in co-operation with an engineer of the United States Reclamation Service in this work and in the collection of data in connection therewith.

DRAINAGE

The year 1922-23 was the fourth of the operations of the Drainage Division of the Reclamation Service, investigating and planning drainage projects under the provisions of the Drainage Regulations.

The Regulations of the Dominion Government and the corresponding Reclamation Acts of the provinces of Alberta and Saskatchewan provide for the reclamation and disposition of wet or submerged Crown lands in these provinces briefly as follows:—

- 1 Sale of Dominion lands in a drainage project not exceeding 1,280 acres to individuals at a minimum price of \$1 per acre under conditions of drainage.
- 2 Sale to the provinces of wet Dominion lands at a minimum price of \$1 per acre to facilitate the construction, improvement and maintenance of public highways.
- 3 Sale to the provinces at a minimum price of \$1 per acre of Dominion lands in drainage districts organized under the provisions of the Drainage Acts of the provinces.
- 4 Construction of drainage works by the Dominion Government where not less than one-half the area affected is vacant Dominion land.

During the season seventy-seven private drainage schemes under Part I of the Regulations were inspected and investigated in Alberta and Saskatchewan; under Part III, twelve drainage projects initiated by the provinces of Alberta and Saskatchewan were inspected; under Part IV, the investigation of one large scheme—the Athabaska project in Alberta, involving about 140 square miles of reclaimable land—was completed, while considerable progress was made towards completing the field investigations of the extensive Carrot River Triangle drainage project in Saskatchewan and Manitoba, which comprises an area aggregating about 1,400 square miles.

In the small projects carried out under the provisions of Part I of the Regulations the results have been very satisfactory both from the applicants'

point of view and from that of the general good of the country. Every small drainage project successfully operated is a distinct benefit to the district in which it is situated, even though carried out at the entire expense of the applicant. Individual farms become more profitable, and by making more land fit for homesteading, drainage brings about more compact settlement and improved conditions of living.

In the middle parts of the provinces where wet conditions have not been sufficient to seriously retard settlement, but still sufficient to cause considerable inconvenience to a number of farmers and to interfere with the traffic of the district, drainage districts have been formed under the jurisdiction of the provinces and debentures issued to raise the necessary funds for construction expenses. Other drainage districts are being petitioned for in many well settled areas.

Under Part III of the Regulations, twelve drainage districts have been formed in Alberta and twenty-two in Saskatchewan. In the north, however, scattered settlement precludes this method of operating, as the bulk of the land in any possible drainage district is still owned by the Dominion Government.

Under the provisions of Part IV of the Regulations, which covers drainage projects initiated by the Dominion Government, thirteen of the thirty-four large projects investigated have been reported feasible and recommended for construction. At present on account of the necessity for economy it has not been considered expedient for the Government to undertake the construction of any of these with the exception of the Waterhen Lake project. Estimates and plans and other necessary data are, however, on file in readiness for the commencement of construction at any time it is thought advisable.

The investigation of the largest project of all, the Carrot River Triangle drainage project, situated between the Saskatchewan and Carrot rivers, and comprising about 1,400 square miles of marsh lands, sloughs and lakes, presented many difficulties on account of the inaccessibility of the tract during the open season. On this account all the available parties of the Drainage Division were put on the work in the late fall in order to rush the surveys as soon as the "freeze-up" made it possible to penetrate the interior. This area promises to be exceedingly rich agricultural land if and when reclaimed. The large shallow lakes, bare of reeds, rushes and other vegetation, will be available for seeding to cultivated grasses as soon as unwatered, while the luxuriant and extensive grass lands that are now generally too wet to permit cutting will gradually be converted from hay lands into arable farm lands. Another field season will see the completion of all the necessary surveys and investigations.

The Waterhen Lake drainage project comprises about 13,900 acres of benefited land. Construction was commenced in the spring of 1921. In the fall of 1922 all the main canals and two of the bridges were completed. There remain to be constructed five bridges and the small laterals and culverts, which it is expected will be completed in the fall of 1923. The water of the lake was drained off by the end of September, 1922, and the bed is now quickly drying up. The parts bare of vegetation will be seeded immediately to timothy and the other parts brought under cultivation as soon as conditions are favourable..

IRRIGATION

V. MEEK, A.M.E.I.C., ACTING COMMISSIONER OF IRRIGATION AND CHIEF ENGINEER

This is a summary of the work accomplished during the year ended March 31, 1923. A more complete account will be found in the separate annual report of the Reclamation Service, and in the original reports of the several engineers filed in the offices of the Reclamation Service at Calgary and Ottawa.

WATER ADMINISTRATION

The primary purpose of this work is to ensure that water rights are not granted in excess of the quantities which may be expected to be available under normal conditions of supply, and to define water rights in such a manner that future conflicting claims may be adjusted with the minimum of friction.

Proper administration requires a knowledge of the flow of streams at all times, and under all conditions. To obtain this information much detailed field work and office study, and the keeping of an elaborate set of records is necessary. The measurement of streams, surveys of drainage basins and their storage possibilities, investigation of soil conditions, studies of precipitation, temperature and winds, and experimental work in duty of water are all essential, and much of this work must extend over a number of years before a reliable estimate of conditions of flow can be obtained.

From the mass of data accumulated, a start has recently been made in the preparation of maps and charts indicating the different areas in which the aforesaid conditions are similar. Definite progress has been made during the year and will be continued. These records will, as they become more and more nearly complete, greatly simplify and expedite the work necessary to determine the run-off in drainage basins and the probable flow in streams.

Conditions are now becoming critical on some streams on which the low-water flow has been fully appropriated, and heavy demands made on the flow at high and flood stages. The construction of reservoirs to store the surplus or flood flow, and make it available for use at the proper time for irrigation, becomes necessary in these cases, and very careful study is required before any further water rights can be granted.

INSPECTION WORK

There was a falling off in the number of applications recorded this year, the total number being 151 as against 232 for the previous year. This, however, did not reduce the work of the five inspecting engineers to any appreciable extent, there being 466 inspections made by the staff engaged on this work in 1921 and 455 in 1922. A number of inspections were also made by other engineers of the branch when their regular duties permitted. The end of the 1922 field season found the inspection work in all districts in very satisfactory condition.

Conditions of water supply are critical in certain portions of the three southernmost inspection districts, viz., the East and West Cypress Hills districts and the Cardston district, and to the engineers in charge of these districts there have been issued watermaster's warrants for their respective districts. As watermasters they are empowered to adopt measures for regulating the diversion of water in settlement of disputes or complaints which occasionally arise.

Domestic Water Supplies.—The number of applications received for permis-

sion to divert water for domestic purposes was about the same as last year. The type of application most frequently received asks for permission to impound the spring run-off from a coulee by means of an earth embankment with a natural or artificial spillway. Many dams of this nature have been illegally constructed through the provinces of Alberta and Saskatchewan, but it is not the policy of the department to take the initiative in preventing these small illegal diversions, providing, of course, no other interests are adversely affected.

During the year many other applications were received asking for water for industrial, municipal, and other purposes. In every case the usual inspection and report were made. The collection of municipal water supply data which was commenced by this branch in 1914, has been continued throughout the past year and the department is indebted to the various towns and cities for the co-operation which has made this work possible. Since January, 1922, nine special inspections for ice-cutting permits have been made outside of the field season. Most applications for ice permits are filed after the close of the field season and early action being necessary, they entail special trips.

The Cypress Hills Inspection District.—This district is divided into two parts, east and west, each being in charge of an engineer. The crops throughout the eastern district were fair, some sections being favoured with large yields while no portion suffered a total failure. A gradual improvement and a more general interest in the methods of irrigating is noticeable. In the western portion of the district the increased demand for irrigation has made necessary very careful inspection of the water available, and an office is maintained in Medicine Hat for the use of the engineer in charge of the district.

Cardston District.—General conditions during the past season were better than in 1921, as the drought was not so severe. Copious rains during the latter part of June and early July saved the later grain crops from failure. Most of the irrigation schemes in this district, which is largely a stock-raising area, are operated for the growing of fodder crops. Good progress has been made in the construction of works on a number of newly authorized projects and good results were obtained where water was applied early in the season.

Special Inspections, Alberta.—An engineer was again assigned to this district, which roughly comprises all that portion of the province of Alberta lying north of township 16. The work includes the inspection of all applications for water rights made under the provisions of the Irrigation Act, and any applications under the Alkali Mining Regulations which contemplate the use of water. Unlike the regular irrigation inspection districts, inspection work is carried on practically throughout the entire year, as a number of applications for ice-cutting permits usually receive attention during the winter months. The number of inspections for irrigation purposes has considerably increased during the past few seasons, diversions by pumping predominating.

Special Inspections, Saskatchewan.—This district, which is in charge of an engineer, comprises roughly the whole of the province of Saskatchewan lying north of township 17. The inspection work is very widely scattered, most of it consisting of domestic and industrial schemes. For the most part the district lies outside of the semi-arid region, and from an agricultural standpoint does not suffer greatly from lack of moisture. For this reason there are comparatively few applications made for irrigation water rights. More attention, however, is being paid to irrigation by settlers in the district and numerous inquiries were made during the past year regarding irrigation. A number of applications submitted under the Alkali Mining Regulations were inspected.

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THE CANADIAN PACIFIC RAILWAY COMPANY'S IRRIGATION PROJECTS

Western Section.—The gross area of this project is approximately 1,000,000 acres of which 218,980 acres are classified as irrigable. The project has now been in operation for some fifteen years, water having been first diverted in 1907 over a small area in the Gleichen district. The whole section has been greatly improved during the past year by the grading and repairing of roads and the construction of about 100 miles of additional telephone lines by the Provincial Government. The area under irrigation during the past season was 49,752 acres, the principal irrigated crop being wheat, which represented over 50 per cent of the total crop area.

Eastern Section.—During the past year large sums of money have been expended in this section on repairs, betterments and renewals. Of the timber structures some 240 have been repaired and 700 renewed. Sixty-four new small structures have been installed in the system and sixteen large concrete structures rebuilt and re-conditioned. Some 347 miles of distributary ditches from 2.5 to 10 feet in bed width have been cleared of silt and weed growth during the past summer by means of dragline and special excavating machines.

The area actually under irrigation during the season was 93,375 acres, as compared with 88,299 in 1921. The value of the crops from the irrigated lands has been estimated at over \$1,400,000 as compared with last year's estimate of \$1,097,000.

Lethbridge Section.—The gross irrigable area covered by water agreements in this project is 113,758 acres. Practically all the land has been sold and approximately 80 per cent of the area lying below the canals is under cultivation. The total area irrigated during the season was 75,558 acres as compared with 56,450 in 1921. The average value of the crops raised on the irrigated lands in this district was \$23.07 per acre, an increase over the 1921 average yields of \$1.32 per acre. The total value of the various crops grown on the irrigated lands during the season has been estimated at \$1,339,000 and at \$230,000 from the non-irrigated lands. There were 865 actual users of water during the season.

Very little new construction has been carried out during the year,—four new bridges were built on the main canal, and on the distributary ditches a number of new timber checks and delivery gates were installed. One specially designed excavator, one dragline excavator, and one dredge have been at work during the season enlarging ditches, removing silt and weeds, raising banks, and generally improving the canal system.

TABER IRRIGATION DISTRICT

This district had a very successful year, not only from the point of view of crop returns, but also in connection with the operation and management of the system. There are 17,244 irrigable acres in the system, and of this area 13,122 acres, representing 76 per cent, were actually irrigated during the season. The operation of the system has been very satisfactorily carried out by the manager with the assistance of two ditch riders.

CANADA LAND AND IRRIGATION COMPANY

This has been a very successful year for the farmers under this project, splendid crops having been harvested. Weather conditions were particularly favourable and the frost-free period extended for 136 days—from May 23 to October 6, giving the farmers an excellent opportunity for growing and harvesting potatoes and garden produce. The fact that during the past few years sweet corn, cucumbers, squashes, cantaloupes, watermelons, and tomatoes have

been grown in considerable quantities and matured successfully on this project is evidence of the favourable climatic conditions during the growing season. The area actually irrigated during the season was 9,809 acres, of which 5,267 were seeded to wheat and yielded 27.9 bushels per acre. The second largest acreage was alfalfa hay with 846.4 acres yielding 2,835 tons or an average of 3.3 tons per acre. From some 380 acres of potatoes an average yield of 190.7 bushels per acre was gained. The total estimated value of the crops grown on the 8,751.7 acres from which crops were harvested was \$242,940.27 which represents an average yield per acre of \$27.73.

During 1922 the company constructed ten miles of drainage ditches in the western district for the disposal of surplus surface irrigation water. Along the Little Bow section of the main canal 69,000 cubic yards of material were moved in connection with the improvement of the canal, much of this being to reduce the pressure at certain critical points where sliding had occurred.

NEW WEST IRRIGATION DISTRICT

Surveys and estimates of cost for this district were completed during the 1921-22 season and received the Minister's approval on January 31, 1922. As now organized the district comprises 4,518.6 irrigable acres, the lands lying almost wholly in the west half of township 14, range 16, west of the 4th meridian. Under an order dated July 21, 1922, the district was officially formed by the provincial authorities of Alberta. Water for these lands will be diverted from the Bow river through the works of the Canada Land & Irrigation Company.

The question of carriage rights for water through the canal system of the Canada Land & Irrigation Company was the cause of some delay in advancing this project, but an agreement has now been reached regarding payment for the use of the works and for a proportionate share of the operation and maintenance costs. An Act to assist the district by guaranteeing their debenture issue up to the estimated amount required, i.e., \$209,500, was assented to by the Provincial Government on March 9, 1923, and preparations are now actively under way for the construction of the works.

SOUTH MACLEOD IRRIGATION DISTRICT

This district lies south of the town of Macleod and immediately west of the Belly and Waterton rivers. The surveys and estimates worked up by departmental engineers showed a project of 61,006.7 irrigable acres to be feasible. Certain school lands and Crown lands had to be withdrawn as special legislation is necessary to make these taxable, and eventually the district was organized on September 21, 1921, under the Irrigation Districts Act with a content of 49,649 acres.

The plans have been approved by the minister and water reserved from Waterton river. The people in the district are very anxious to have irrigation and have complied with all the necessary requirements, but can do nothing more at present as the provincial authorities have declined to guarantee their bonds until they see what progress is made by other large districts whose debentures have been guaranteed.

LITTLE BOW IRRIGATION DISTRICT

This consists of some thirty farms scattered for a number of miles along both banks of the Little Bow river. It is proposed to divert water from Highwood river into the Little Bow—which has not sufficient natural flow—by means of community headworks and a canal, and to re-divert to the individual farms

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by pumping plants installed by the several land owners. Surveys were made and estimates prepared in 1921. The district was officially formed on March 5, 1922. The approval of plans and a reservation of water from the Highwood river was obtained from the Minister of the Interior on April 10, 1922, and the necessary advertising having been completed, authorization to construct the works was issued on July 15, 1922.

The irrigable area at present actually included in the district is 2,625 acres and the estimated cost of constructing the community works is \$36,100, or \$13.75 per irrigable acre. As, however, the Government of the province of Alberta has decided to purchase bonds up to \$18,000 in consideration of the use of the works in connection with their license for the diversion of fifty cubic feet per second for the domestic use of the settlers along the Little Bow river, the cost per acre to the individual is reduced to \$6.90. Provision has been made for the enlargement of the district to a little over 3,000 irrigable acres.

Construction was started on the headworks and river protection work in December, 1922, and has progressed as rapidly as the varying weather conditions would permit. It is expected the headworks will be completed in the spring, the excavation for the main canal will be commenced as early in the season as possible and all construction is to be finished in 1923.

MEDICINE HAT EASTERN IRRIGATION DISTRICT

In the 1921-22 report it was pointed out that several designs for this project were not considered economical because of the inadequate water supply and that the department was investigating a scheme whereby the spring flood water might be used to provide a partial water right from Ross and Bullshead creeks.

With the permission of the minister copies of the plans and reports of this flood scheme were furnished to the officials of the irrigation district, who then submitted their project to the provincial authorities for the guarantee of the bonds of the district. After investigation, the provincial authorities decided that conditions were not such as to warrant the guaranteeing of the bonds but that as the cost was not high the district itself should be able to finance the project, and this the district officials are endeavouring to do.

MEDICINE HAT SOUTHERN IRRIGATION DISTRICT

The first surveys for a project to serve 5,300 acres from Sevenpersons and Paradise creeks were fully reported upon in the 1920-21 report. A district was duly erected and officers appointed under the provisions of the Irrigation Districts Act of Alberta in January, 1921. In 1921 the project was reported on by consulting engineers and not approved as the water supply was considered unsatisfactory.

During 1922 further surveys and studies of the reservoir possibilities in the Sevenpersons drainage basin were made by the department. One site was located in which some 13,000 acre-feet might be stored and from which approximately 3,000 acres might be irrigated. The possibilities of utilizing this storage for the irrigation of the most suitable adjacent lands are now being investigated.

ROBSART-VIDORA IRRIGATION DISTRICT

This is a project south of Maple Creek town. It is proposed to divert water from a reservoir in the Frenchman River valley for the irrigation of 10,000 acres at an estimated cost of \$34 per irrigable acre. A detailed report, estimates, and plans were furnished the district officials in 1922, and the parties interested

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have decided to proceed with the formation of a district under the provisions of the Saskatchewan Irrigation Districts Act. A petition for organization has been forwarded to Regina, and the provincial authorities now have the matter in hand.

LETHBRIDGE NORTHERN IRRIGATION DISTRICT

Construction work, commenced in July, 1921, has been carried on vigorously, and canal excavation and nearly all the structural works are now complete. It is confidently expected that the system will be ready for operation by May, 1923.

The Irrigation Council has conducted a land selling campaign during the year, in order to assist the farmers in disposing of their surplus irrigable acreage. Many inquiries have been received from all parts of the world and the land is being disposed of in holdings of from forty to one hundred and sixty acres, at prices varying from \$12 to \$50 per acre according to location and development.

UNITED IRRIGATION DISTRICT

Construction work on this project, commenced in 1921, was continued during the year, the excavation of the main canal and laterals being completed in November, 1922. Concrete and timber structures are not quite finished, but it is anticipated that these works will be ready for use before the commencement of the irrigation season of 1923.

Steps have recently been taken to extend the boundaries of the district northward to include some 2,500 additional acres of irrigable land and it is confidently expected that this area, as well as the original district, will be under irrigation during 1923. There are some individual holdings in the district which are considerably in excess of 160 acres, but no difficulty is anticipated in regard to the disposal of any surplus irrigable lands, as this district is likely to prove very successful under irrigation.

LETHBRIDGE SOUTHEAST PROJECT

As its name implies, this project comprises land south and east of the city of Lethbridge. It is proposed to divert water from the Waterton, Belly, St. Mary, and Milk rivers and by means of storage reservoirs at a number of points to regulate and conserve the available water supply.

Surveys were completed in 1922 after several years of continuous work and the latest estimates show a feasible project of 414,400 irrigable acres at a cost of \$16,622,000, or a cost per irrigable acre of \$40.11. The irrigable area is divided into twenty-nine districts, of which two or three have now organized and may proceed to construction at an early date.

During the field season surveys were made for a number of extensions to, and revisions of, this project. These included complete surveys of two new districts which have now been added to the project, the Writing-on-Stone district of 12,300 irrigable acres, and the West Magrath district of 10,266 irrigable acres; other important pieces of work completed were: a revision of the supply canal to Chin reservoir and also of the drainage canal from Horsefly lake, and survey of a possible reservoir site on Waterton river.

Estimates have been completed of the several revisions noted above and the plans and estimates of the Lethbridge Southeast project revised accordingly. This completes the surveys of this project and the plans and estimates have been made available to Mr. D. W. Hays, Consulting Engineer, who has been engaged by the department to report on the project.

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SOUTH SASKATCHEWAN IRRIGATION PROJECT

Resolutions passed by a number of municipalities in the district adjoining the Empress branch of the Canadian Pacific railway south of the South Saskatchewan river, were, early in 1922, submitted to the Minister of the Interior requesting the Dominion Government to undertake surveys and determine the possibility of pumping water for irrigation to suitable lands in this district. The plan suggested was to create sufficient water-power by damming the South Saskatchewan river, to pump water from the river to the adjoining lands, and it was submitted that this scheme might be carried out in conjunction with the proposed South Saskatchewan general scheme of water supply for the Moose Jaw-Regina district. A party was assigned to this work for a short time to investigate the feasibility of pumping for irrigation and also of extending canals of the proposed North Saskatchewan project southerly across the river to the lands under consideration.

After a reconnaissance of several possible schemes, preliminary surveys were made of the following:—

1 An extension of the canal system of the North Saskatchewan project across the South Saskatchewan river by means of a siphon in section 2, township 24, range 24, west of the 3rd meridian.

2 A pumping scheme from the South Saskatchewan river by means of power generated by a hydro-electric plant located on the river at some point in township 20, range 16, west of the 3rd meridian.

The first scheme was considered in conjunction with the North Saskatchewan project and includes 135,000 acres of land in the Leader, Prelate, Sceptre, and Cabri districts, while the second provides only for 64,000 acres in the Cabri district. Since both schemes depend upon the development of other works, it is not yet possible to arrive at any definite conclusion as to their feasibility.

RETLAW-LOMOND IRRIGATION PROJECT

Petitions received from the majority of the landowners within the boundaries of the proposed Retlaw-Lomond project, in townships 10 to 17, ranges 17 to 20, resulted in a complete plane-table survey being carried out in this area during the 1922 field season. From previous investigations it was known that it was possible to divert water from either the Bow river through the works of the Canada Land & Irrigation Company or from the Oldman river through the works of the Lethbridge Northern district to supply this project.

Field work was commenced on May 10, 1922, and was finished on December 2, the total number of acres plane-tabled being 227,730. In addition to this 570 miles of levels were run, and 129 soil samples obtained and tested. Since the completion of the field-work an office party has been engaged on the design and estimation of distributary systems to serve the maximum commanded area under both the Bow river and Oldman river sources of supply. It is expected that this work will be completed in the near future.

MAGRATH IRRIGATION PROJECT

During 1922 residents on lands in townships 5, 6, and 7, ranges 21, 22, and 23, west of the 4th meridian, took steps to form an irrigation district under the Provincial Act of 1920, and obtain water from St. Mary river through the canal system of the Alberta Railway & Irrigation Company.

Departmental surveys show that the maximum area which could be irrigated in the district is 30,672 acres, and a tentative agreement has been arrived at

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between the district and the Canadian Pacific Railway Company, which controls the Alberta Railway and Irrigation Company's system, for the delivery of sufficient water for 14,430 acres, the area it is now desired to irrigate. The scheme is entirely feasible and the construction cost of the supply works has been estimated at \$158,600, or slightly over \$12.65 per irrigable acre.

MOUNTAIN VIEW IRRIGATION DISTRICT

As a result of requests from residents in townships 2 and 3, ranges 27 and 28, west of the 4th meridian, a reconnaissance and later a complete survey were made to determine the possibility of irrigating lands in the area and a feasible scheme has been planned to serve 2,500 acres from the Belly river at a cost of approximately \$13.50 per acre. Plans and estimates have been approved and handed over to the district. The matter is now in hand with the province and the official formation of the district will probably take place early in 1923.

NORTH SASKATCHEWAN PROJECT

This project has been under consideration by the department for a number of years and is fully discussed in previous departmental reports.

During the field season of 1922, preliminary surveys were continued and in addition the project was inspected by a consulting engineer, Mr. D. W. Hays, on behalf of the department.

This project consists of all lands suitable for irrigation within a block of 20,000,000 acres, the boundaries of which extend from a point near Coronation southward to the Red Deer river near Duchess, and eastward as far as the South Saskatchewan river between Outlook and Saskatoon. Some investigations have also been made to include lands to the south of the South Saskatchewan river adjoining the Empress branch of the Canadian Pacific railway. It is estimated from the surveys made that there is an irrigable area of about 1,400,000 acres within the block above outlined, and an additional 135,000 acres to the south of the South Saskatchewan river. Considerable areas along Kneehill, Threehills, and Ghostpine creeks could also be irrigated from a relocation of the main canal from the Red Deer river, but further surveys are necessary in order to determine these areas.

Extensive storage is required to augment the water supply from the North Saskatchewan, Clearwater and Red Deer rivers in order to irrigate the whole of the area, and investigations have been made of a number of reservoir sites on the rivers as well as throughout the irrigable areas. Much time has been devoted to studies of water supply and preliminary estimates of cost and, while it is not yet possible to speak with any certainty, it appears that the cost per acre of the necessary works will be high.

HIGHWOOD RIVER IRRIGATION PROJECT

The first field investigations of this project were made in 1920, when a reconnaissance was carried out primarily for the purpose of diverting the Highwood river to lake McGregor as a water supply for the proposed Retlaw-Lomond district. It was ascertained that under such a diversion canal between High River and lake McGregor there would be a large area of land, mainly in the Champion district, which would require the water from the Highwood river for irrigation. In 1921 preliminary surveys were made to determine the feasibility of this project and consisted mainly of surveys of proposed reservoir sites, main canals and main distributaries.

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On September 1, 1921, a memorial was filed by the landowners in the district asking that surveys be continued to finally determine the feasibility of irrigating their lands.

A standard party of three plane-tables was employed during the field season of 1922 to make a complete topographic survey of the project. This was finished by the middle of December and a system designed during the winter months to irrigate some 52,000 acres at an estimated cost of \$2,071,000, or \$39.50 per irrigable acre.

ALKALI TEST PLOTS AT MAPLE CREEK, SASKATCHEWAN

During the field season of 1921 surveys were made for a proposed project to irrigate the Maple Creek flats. These lands are topographically suitable for irrigation but the soil consists of a heavy clay, of high alkali content, and it was considered that the application of irrigation water might have the effect of concentrating these injurious salts near the surface in quantity sufficient to prevent crop growth. In order to demonstrate the effect of irrigation on soils of this type it was decided to make a series of experiments under actual field conditions for an extended period.

Suitable plots were secured on the outskirts of the town of Maple Creek where soil conditions are similar to the Maple Creek flats, and where a reliable water supply is available from the town mains. One-third of the land was left undisturbed in prairie sod and the remainder broken and seeded to cultivated grasses and grains. One 6-inch and two 4-inch irrigations were applied to each plot during the season. Fair results were obtained considering that the plots were not seeded until May 27 owing to the necessity of breaking and preparing the land. A series of soil samples to a depth of six feet were obtained to determine the alkali content, and to form a record for comparison with future samples, to indicate any change in the relative position of the salts which may occur as a result of irrigation.

REPORT ON DUTY OF WATER INVESTIGATIONS FOR 1922

Under the provisions of the Irrigation Act the Minister is required to fix the duty of water, or amount required to produce maximum crops. To determine what this amount should be, and, consequently, how much should be allotted to applicants, investigations have been carried on at different points for a number of years.

The depth of water required for any locality varies from year to year, in accordance with the amount and seasonable distribution of the rainfall, and to a lesser extent as influenced by temperature and the conditions of soil and subsoil. At the present time eighteen inches is fixed as the depth, which in addition to normal precipitation, will produce the best general results on all crops, under all conditions. In a few localities less than this is required, and a special duty recommended. The investigations and experiments carried on are also of great value to irrigators as indicating the amount of water they should apply to a given crop under varying soil and temperature conditions.

The season of 1922 was more favourable for crop growth than any season since 1917. This was due principally to the June precipitation, which was above average and well distributed, and to the absence of destructive hot winds such as have occurred during May and June of previous seasons. Work done and results arrived at during the past season's work are given more fully in the separate report of the Reclamation Service.

At the Brooks Farm, the crop rotation schedule adopted some years ago to maintain the fertility of the soil has been continued, and during 1922, the

water requirements of wheat and oats were determined under four different conditions of soil fertility, barley under three, potatoes under two, and flax under one. Similar experiments were carried on with alfalfa hay, grass hay, field corn, peas, and the production of alfalfa seed.

Irrigation investigations were carried out in the Coaldale district along the same lines as in previous years. Because of cold wet weather in April work was late in starting but excellent progress was made from May onward.

On eleven fields in forage crops in 1922, from which first-class crops were cut, the average total depth of water received was 1.72 feet, and on four good fields of grain crops the total received was 1.15 feet. In each case 0.67 foot was natural precipitation and the remainder irrigation.

DRAINAGE

J. S. TEMPEST, M.E.I.C., SUPERVISING HYDRAULIC ENGINEER OF THE DRAINAGE DIVISION

During the fiscal year 1922-23 drainage inspections, investigations, and construction were carried on in Alberta, Saskatchewan, and Manitoba by the Drainage Division of the Reclamation Service as follows:—

Alberta.—Location survey of the Athabaska project; investigating surveys and plans of 61 private schemes, and inspection of 9 provincial schemes.

Saskatchewan.—Location survey of the western section of the Carrot River Triangle, construction of Waterhen Lake project; surveys and plans for 6 private schemes, and inspection of 3 provincial schemes.

Manitoba.—Location survey of eastern section of Carrot River Triangle.

Drainage projects investigated are of three classes,—(1) small schemes undertaken by individuals, generally settlers, with a view to raising more winter feed for their stock; (2) schemes undertaken by the provincial governments, to enable groups of settlers to co-operate in carrying out comprehensive drainage schemes for the improvement of their own lands and any Crown lands in the drainage district; and (3) schemes initiated by the Dominion Government for the reclamation of large tracts of swamp lands where upwards of 50 per cent of the land is owned by the Crown. Schemes in classes 1 and 3 are generally situated in the more northern parts of the provinces, where the prevalence of wet lands, swamps, muskegs, and shallow lakes is more marked and where settlement is sparse. Schemes in class 2 are carried out under the jurisdiction of the provincial governments after being inspected and sanctioned by the Dominion Government.

The efforts of the engineers of the Drainage Division have not been confined merely to the engineering requirements of surveying, making plans, and supervising construction of the various projects, but much time and study have been given to the most economical methods of bringing the areas under cultivation after drainage, which in many cases involves the most difficult and uncertain part of reclamation.

No new large drainage projects under Part IV of the Drainage Regulations were investigated during the season, but an attempt was made to complete the surveys of all those already commenced. This work was entirely confined to the Athabaska project in Alberta and the Carrot River Triangle project in Saskatchewan and Manitoba. The field investigations of the former were completed, but another season will be required to complete the latter. Since the formation

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of the Drainage Division, 34 large projects have been investigated. Of these only 13 projects aggregating about 269,000 acres have been favourably reported on as feasible, economical, and in the public interest.

ATHABASKA DRAINAGE PROJECT

This project lies a few miles east of the town of Athabaska between the Athabaska river and its tributary, Pine creek, in townships 65 to 68, ranges 19 to 22 west of the 4th meridian. With a desire to develop a country of naturally rich soil and good climate, the Athabaska Board of Trade and many interested settlers petitioned the Federal Government to undertake the reclamation of the swamp lands under the provisions of Part IV of the Drainage Regulations. A reconnaissance made in 1921 resulted in a favourable report and a recommendation that a detailed location survey should be made. A survey party occupied the season of 1922 in making a complete survey. The engineer reports that the project, comprising a total area of 46,800 acres of reclaimable land, can be drained at an average cost of less than \$4 per acre.

The plan of reclamation proposed consists of twenty individual systems; three draining into Athabaska river and the remainder into Pine creek, the majority of the latter being comparatively small single ditches. The improvement of Pine creek necessary to prevent an increase of flood conditions would require only the removal of the debris collected at several points. The total length of ditch required, including laterals and creek improvements, aggregates about 135 miles.

CARROT RIVER TRIANGLE DRAINAGE PROJECT

The Carrot River Triangle is a tract of swamp land situated in the provinces of Saskatchewan and Manitoba, and bounded on the north by the Saskatchewan river, on the south by the Carrot river, and on the west by the Sipanok channel—an overflow channel of the Saskatchewan river. The tract comprises an area of 695,168 acres, or 1,086 square miles, with a further 350 square miles in the Pasquai extension of the swamp. The climate is similar to that of the settled agricultural district in the upper Carrot River valley around Kinistino, Melfort, and Prince Albert, with possibly a greater liability at present to summer frosts and a later spring, on account of the prevailing wet and swampy conditions. The soil is the same rich black muck overlying clay and clay loam that characterizes the fertile upper part of the Carrot River valley.

Transportation facilities at present consist of the Canadian National railway touching the eastern extremity of the triangle at the town of Pas, Manitoba, which is 400 miles by rail from Winnipeg. From Pas both the Saskatchewan and Carrot rivers are navigable for boats of small draft to the northwestern and southwestern extremities of the triangle. No part of the tract is more than 16 miles from either one or the other of these navigable streams.

After drainage very little expense and labour will be necessary to bring under cultivation or convert into profitable hay meadows the greater part of the area lying in Manitoba and consisting of several hundred square miles. This portion consists largely of Saskeram and other lakes, the beds of which are so bare of reeds, rushes, and grasses as to be ready for seeding to cultivated grasses as soon as the water has been drained off. The rest of the area in Manitoba consists mostly of luxuriant hay meadows.

In Saskatchewan, although there are many shallow lakes bare of vegetation, and considerable stretches of hay meadows, there is a large proportion of moss muskegs, stretches of reeds, rushes, and scrub timber that will require

considerable clearing after the water is drained off, and therefore will not be reclaimed as economically as the Manitoba portion. The method of reclamation will consist in the construction of levees along the banks of the Saskatchewan and Carrot rivers to keep out the flood waters, and of a system of interior drainage ditches to carry the run-off to sumps, and thence to be pumped over dykes into these two streams.

Until the surveys are completed, and several plans of reclamation considered and compared, the cost of the project or units of the project can only be roughly estimated. Two schemes of reclamation are being considered. In scheme "A" the reclamation of the whole area is contemplated. It is roughly estimated that this scheme would involve an expenditure of \$6,077,000 to reclaim 695,168 acres of land, or an average cost of \$8.74 per acre. Scheme "B" contemplates only the reclamation of the eastern or Manitoba end of the triangle, and cutting off this area from the rest of the tract by a levee extending from the Carrot to the Saskatchewan. It is roughly estimated that this scheme would cost \$2,112,000 to reclaim 163,456 acres, or an average of \$12.92 per acre.

WATERHEN LAKE DRAINAGE PROJECT

This project, comprising 13,900 acres, is situated in the Carrot River valley about four miles from the town of Kinistino, Saskatchewan, in townships 44, 45, and 45A, ranges 21 and 22, west of the 2nd meridian. The drainage of this project was undertaken by the Dominion Government and a drainage district was formed in 1920 under the provincial laws. The work of excavating the main ditches was commenced in the spring of 1921, and completed in the fall of 1922. The water of the lake was tapped on July 13, 1922, and was completely drained by August 14 the same year.

After unwatering, the lake bed began to dry very quickly where there was no vegetation and matted roots, and by September it was possible to walk dry shod over the greater part. The marsh and the parts of the lake covered by rushes and coarse grasses are drying very slowly. The additional laterals that are about to be constructed will help to expedite the drying up of these parts very materially. On account of the drier conditions a larger quantity of wild hay was cut than ever before, both on the lake and on the marsh.

About half the lake bed, comprising about 3,000 acres, is now ready for seeding to timothy or other cultivated grass. To complete the works of the project there yet remain to be constructed about 10,000 rods of small laterals, a number of culverts at road crossings, six bridges, right-of-way fencing, and topping of levees.

SMALL DRAINAGE PROJECTS

During the season 77 drainage schemes coming under the provisions of Part I of the Drainage Regulations were inspected. At the present time there are about 15,000 acres of low lands included in these small private schemes being brought under cultivation, and about 20 per cent reclaimed and under crop. The average cost of this reclamation is from \$5 to \$8 per acre. During the year approximately 1,200 tons of wild hay and 1,060 tons of timothy were produced in Alberta on reclaimed swamp lands in these small projects.

PART V

DOMINION WATER POWER BRANCH

REPORT OF THE DIRECTOR AND CHIEF ENGINEER OF WATER-POWER, J. B. CHALLIES, C.E., M.E.I.C.

The past fiscal year saw the Dominion Hydrometric Survey finally rounded out as a Dominion-wide organization by the completion of the co-operative agreement with the province of Quebec whereby the organization of the Federal Hydrometric Survey was extended to that province.

The past year was also noteworthy as producing a decided acceleration of water-power development; Canada appears to have nearly accomplished the transition from war to peace conditions; industry is stabilizing, and capital is available for development in quantities and for rates unobtainable since 1914. New water-power enterprises have been initiated at many widely separated points and these combined with the increasing cost of coal justify the expectation that water-power installation in Canada will continue to grow at a rate at least as great as that maintained during the past decade.

ORGANIZATION AND SCOPE

The activities of the Dominion Water Power Branch are both administrative and investigatory. The administrative phase of the work arises from the proprietary interest of the Dominion in the water resources in the provinces of Alberta, Saskatchewan, and Manitoba, the Northwest and Yukon Territories, and in the Railway Belt of British Columbia. In this connection the department must of necessity secure such fundamental engineering and economic data as will enable it to consider applications for power privileges, and to control the development, the distribution, and the sale of hydro-electric energy. This is the prime responsibility of the branch.

Throughout the remainder of the Dominion the water-powers are vested in the provinces and investigatory work is carried on in co-operation with the respective provincial authorities charged with their administration. The branch also co-operates extensively with federal departments and commissions other than the Department of the Interior, the services of its engineering field staff, in the interests of general economy and efficiency, being made available to such other departments and commissions.

The co-operative facilities for water resources investigation work throughout the Dominion are as follows:—

British Columbia.—The local organization of the branch, with headquarters at 119 Pender Street West, Vancouver, carries on a broadly planned hydrometric survey and systematically secures fundamental data necessary to a complete analysis of the water-power resources, in accordance with the terms of a co-operative agreement with the Provincial Water Rights Branch of British Columbia.

Alberta and Saskatchewan.—The local organization of the branch, with headquarters at 513 Eighth Avenue West, Calgary, carries on direct administrative

work throughout all parts of the two provinces, in virtue of the proprietary interest of the department in their water-power resources. The investigatory work comprises a comprehensive hydrometric survey and a systematic and exhaustive field and office analysis of the water-power resources of the two provinces.

Manitoba.—The local organization of the branch, with headquarters at 231 Chambers of Commerce Block, Winnipeg, carries on direct administrative work throughout the province, in virtue of the proprietary interest of the department in the provincial water-power resources. A comprehensive hydrometric survey is maintained, as well as a systematic and exhaustive field and office analysis of the provincial water-power resources. In the interests of administrative economy the investigatory work carried on through the Manitoba office has been extended to cover that portion of Ontario lying west of and including lake Nipigon.

Ontario.—The local organization of the branch, with headquarters at Ottawa, carries on a comprehensive hydrometric survey and systematically secures fundamental water resources data in accordance with the terms of a co-operative agreement with the Ontario authorities. The closest co-operation is maintained with the staff of the Ontario Hydro-Electric Power Commission.

Quebec.—The local organization of the branch, recently established with headquarters at Postal Station "H", corner of St. Catherine and Bishop streets, Montreal, is developing a comprehensive hydrometric survey and has commenced the systematic collection of fundamental water resources data as required by the terms of the co-operative agreement with the Quebec authorities. The closest co-operation is being maintained with the staff of the Quebec Streams Commission.

The Maritime Provinces.—The local organization of the branch, with headquarters at 193 Hollis street, Halifax, in accordance with the terms of a co-operative agreement with the three respective provincial authorities of New Brunswick, Nova Scotia, and Prince Edward Island, carries on a systematic hydrometric survey and a comprehensive and continuous power and storage survey of the three provinces, with a view to securing the fundamental data necessary to a complete analysis of their water-power resources. In New Brunswick, the branch collaborates with the New Brunswick Electric Power Commission; in Nova Scotia with the Nova Scotia Power Commission; and in Prince Edward Island with the provincial authorities.

Yukon and Northwest Territories.—Administrative and investigatory work in the territories form a direct responsibility of the Dominion Water Power Branch in virtue of the proprietary interest of the department in their water-power resources. Investigatory work in the Yukon is handled through the British Columbia organization. In the North West Territories such work is directed from head office, as exigencies demand.

The field organization of the department is based upon and built up around the Dominion Hydrometric Survey staff through which systematic and continuous stream measurement studies are carried on throughout the Dominion. The hydrometric survey field staff is employed in a systematic and continuous field analysis of the country's water-power resources. The data systematically accumulated through this work and through co-operative agreements and studies with other organizations are collated, analyzed, and standardized in the head office of the branch at Ottawa.

As a result, there is now on file in the offices of the Dominion Water Power Branch general and detailed information in respect to run-off and power possibilities of the more important power rivers throughout the Dominion. These

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data are constantly being brought up to date as new or later information is received and are promptly available for reference purposes to all interested in the utilization of the water-powers of the Dominion.

THE LAKE OF THE WOODS CONTROL BOARD

The Lake of the Woods Control Board was, as in the previous year, responsible for the regulation of the level and outflow of Lake of the Woods. At the same time certain investigations were carried on in connection with the storage potentialities of lac Seul and of the boundary waters tributary to Rainy lake.

As heretofore regulation of Lake of the Woods embraced the continuous collection of hydrological data relating to the watershed. High precipitation immediately previous to and during spring break-up necessitated the full opening of the Norman dam in April. As a consequence of this precautionary measure lake level did not exceed an elevation of 1060.6 feet, a stage reached on May 25. High outflow was maintained until the first week in July when a partial closure of the Norman dam was ordered. Lack of precipitation in September necessitated the complete closure of the Norman dam but as a result of continued drought in the following month lake level dropped to an elevation of 1059.1 feet. High precipitation occurred at the time of freeze-up and there was a consequent rise in lake level throughout the winter months.

In conformity with the recommendation of the International Joint Commission for the provision of increased outflow capacity from the Lake of the Woods, the board carried on detailed field and office investigations of the most feasible and proper method of providing such increased capacity.

Necessary to a final recommendation by the board as to the storage range on lac Seul, continuous records of lake level and outflow were secured throughout the year. At the same time certain interrelated investigations were made of the upper English river and at the request of the board, the Geodetic Survey of Canada traced a line of precise levels from lac Seul to the junction of the Winnipeg and English rivers and from the latter point up the Winnipeg river to Kenora.

WATER POWER REGULATIONS AND LEGAL RESEARCH

The collection of translations of foreign acts and regulations has been continued during the year.

There has been considerable activity in water-power development in Europe, and this has necessitated some modifications in the basic laws passed by most of the European countries in the period 1916 to 1920, to which reference was made in the Annual Report of the Dominion Water Power Branch for 1921-22, in order to provide for changing economic and industrial conditions. This has been particularly the case in France and Italy, where economic conditions have been somewhat difficult, and has caused a series of changes to be made in the general regulations for the acquisition and development of water-powers adopted by these countries in 1919 and 1920. These supplementary decrees have been translated, and the records containing the water-power laws of Norway, Switzerland, France and Italy have been revised in accordance with the new material received.

Official publications dealing with the national electrical systems of Germany and Sweden, the electrification of the Swedish state railways, and the administrative systems of Switzerland and the Dutch East Indies were also received and translated.

The revised Dominion Water Power Regulations which have been in force since October 31, 1921, were described at some length in the Annual Report for 1921-22, so that no further reference to their provisions need be made, as they

are somewhat long and perhaps difficult to grasp without considerable study. An explanatory pamphlet has been prepared which describes briefly the principles on which they are based, outlines the various steps to be taken in acquiring a license under the Water Power Act, and explains the general rights and obligations of a licensee with particular reference to the financial conditions affecting the security of his investment. These latter include the initial financing of the undertaking, rentals payable to the Crown, regulation of rates, service and the issue of securities, the compensation payable to the licensee when the licence is terminated or cancelled, and the conditions under which a license may be so terminated or cancelled.

Copies of this pamphlet and of the regulations themselves may be obtained on application to the Director of Water Power.

During the year a systematic study was begun of the laws passed by the various legislative bodies in Canada since their inception, dealing with the uses of water, with particular reference to the use of water in the development of power. This survey of the legal principles and administrative procedure which form the basis of water-power development throughout Canada is substantially completed as regards the provinces of British Columbia, Alberta, Saskatchewan, and Manitoba, and some progress has been made with the Maritime Provinces. It is hoped to complete this work during the coming year, after which it will be published in suitable form. It is believed that this is a subject which has not hitherto received adequate attention and that the published results will be found useful for a variety of purposes.

In connection with this work a list of the acts at present in force in Canada, governing the use of water, was prepared at the request of the Commissioner of Drainage and Waters of the State of Minnesota.

BRITISH COLUMBIA ADMINISTRATION

In the Railway Belt of British Columbia the waters and water-powers, although they form part of the public property of the Dominion, are administered by the provincial authorities (except within the Dominion parks) under the provincial water acts, and as the Dominion lands within the Railway Belt are administered by this department it is necessary that the two systems of administration work together in harmony. This involves close co-operation between the Dominion and provincial officials which has been attained in a very satisfactory manner, and enables the responsible officers of this department to exercise a proper degree of supervision over Dominion interests in the waters and the other natural resources affected by their use, and at the same time it establishes a uniform method of acquiring water rights for all purposes throughout the province.

The examination of water records issued by the province appurtenant to lands within the Railway Belt has been continued and the work further systematized. Plans are compiled to show the lands affected in each case, and the granting of necessary rights of use or occupation of Dominion lands under the Water Lands Regulations is proceeding satisfactorily in co-operation with the British Columbia Lands Branch and the Forestry Branch of this department.

A considerable amount of work is done in the Railway Belt by the branch engineers on behalf of the Department of Indian Affairs. Reports are prepared dealing with systems of water supply for the Indian reserves for irrigation, domestic, and other purposes, and works of this nature authorized by the Indian Department are carried out under the supervision of the branch engineers.

Another important phase of this work is the investigation of water rights appurtenant to the Indian reserves in the province, collecting material in support of the Indian claims and preparing it for the information of the Board of

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Investigation under the Water Act. Five reports have been prepared in this connection tabulating the water records appurtenant to Indian reserves in each of the five agencies in the Railway Belt, and the information thus compiled has been of great assistance to the board in their work of adjudication and has enabled the Indian claims to be adequately presented at the hearings held by the board.

WATER RESOURCES INDEX INVENTORY

The Index Inventory system for recording and collating the water resources data of the Dominion has been in actual use for the past few years and has provided a most efficient method for the referencing, analysis, standardization, and filing of all data relating to the subject of water resources. The fundamental principles of this system have been referred to in previous annual reports and a complete description has been published as Water Resources Paper No. 32.

The system has been applied to practically all phases of the work carried on by the branch, among the more outstanding of which may be mentioned the complete census of developed water-power and central electric station activities, the analysis of the undeveloped water-power resources, the analysis of the stream measurement activities, and the storage studies carried on throughout the Dominion.

This work has been largely carried on in co-operation with provincial organizations, notably the Hydro-Electric Power Commission of Ontario, the Quebec Streams Commission, the Water Rights Branch of British Columbia, the New Brunswick Electric Power Commission, and the Nova Scotia Power Commission. Resulting therefrom a large proportion of the water resources data of the Dominion has been compiled in standardized form for whatever purpose required, and this material is being continually revised and brought up-to-date as authentic information is secured.

WATER-POWER RESOURCES OF CANADA

The process of collating and analysing existing stream flow and power data is a continuous one and the over-all estimate of water-power resources is periodically revised when new or revised data are sufficient to justify the labour which a new compilation involves. No new compilation was undertaken during the past fiscal year so that the estimate given last year may be repeated.

The recorded power available throughout the Dominion under conditions of ordinary minimum flow is 18,255,000 horse-power, while that ordinarily available for at least six months of the year is 32,076,000 horse-power.

There are installed to date throughout the Dominion water-wheels and turbines to the extent of 2,973,800 horse-power. This installation represents an investment of over \$620,000,000 and a coal economy of 26,700,000 tons annually which, at \$10 per ton, would cost \$267,000,000, a large portion of which sum would be required to pay for coal importations.

As was pointed out last year, existing practice in Canada indicates that it is commercially feasible to install water-wheels and turbines to an extent 30 per cent greater than that corresponding to the above six-month estimate. This being the case the present recorded water-power resources of the Dominion would permit a turbine installation of 41,700,000 horse-power. On this basis the present installation is approximately 7 per cent of that ultimately possible.

The 2,973,800 horse-power at present installed throughout the Dominion is apportioned to the following uses:—

2 204,500 horse-power in central electric stations for general distribution purposes, such as, operation of street railways, mines, electro-chemical and electro-metallurgical industries, pulp and paper mills, and general industrial and domestic use.

484,200 horse-power is installed in pulp and paper mills. In addition there is used in the pulp and paper industry 161,000 horse-power purchased from central electric stations.

285,000 horse-power is installed in industries other than central electric stations and pulp and paper mills.

The total installation for the Dominion averages 338 horse-power per thousand population, which figure places Canada second only to Norway in the per capita utilization of water-power.

During 1922 the turbine installation in Canada increased by practically 250,000 horse-power, while 190,000 horse-power installed in 1921 was not placed in operation until 1922. The new installation took place in sixteen different power plants scattered from Halifax to Vancouver, two of which, situated on the Winnipeg river in Manitoba, are within the administrative jurisdiction of the department.

More significant, probably, than the actual installation has been the rapid growth of new development for there is at the present time approximately 1,000,000 horse-power either under construction or actively projected. This progressive development of "white coal" gives assurance that, not only will the average citizen continue to have an ample supply of electric power in the home and for general public utility services, but that there will also be sufficient surplus power to stimulate both the growth of present and the establishment of entirely new industrial enterprises.

CENSUS OF THE CENTRAL ELECTRIC STATION INDUSTRY

Owing to the fact that over 97 per cent of the electrical energy generated by the central electric stations of Canada is produced by the development of our widely distributed and advantageously situated water-powers, the gathering and analysis of accurate statistics of the industry becomes of prime importance to the Dominion Water Power Branch.

Under the terms of a co-operative agreement between the branch and the Dominion Bureau of Statistics and as part of the Census of Industry conducted by the bureau, an annual census of the central electric station industry is taken. The fifth annual census was completed during the past year and an exhaustive analysis of the data gathered is being published in two sections, Part I presenting a general census and statistical digest of the industry as at January 1, 1922, together with the necessary explanatory text, and Part 2 comprising a comprehensive directory of all public or privately-owned organizations distributing electrical energy for sale showing investment in plant and equipment, installation, mechanical equipment, service, location of power for sale, rates and transportation available.

While the data included in the directory are based on the statistics of Part I, it has been possible to include considerable later data, the date to which each particular description is complete being placed at its head.

Copies of Part I (Statistical) of this report may be obtained upon application to the Dominion Bureau of Statistics; for Part 2 (Directory) applications should be addressed to the Director of Water Power.

The 857 stations included in the census may be divided into two main classes: first, those developing or distributing electricity generated from water-power and, second, those developing or distributing electricity generated by the consumption of fuel. The first class includes 588 stations, of which 259 are actively engaged in the generation of power, and 329 which buy power *en bloc* from these hydraulic generating stations and distribute it to their customers.

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The second class consists of 251 stations producing electricity by the consumption of various kinds of fuel, and 18 which distribute power purchased from them.

Of the total primary power installation of 1,977,857 horse-power, 1,826,357 horse-power, or 92.4 per cent, is installed in hydraulic generating stations, the primary power equipment of the fuel stations amounting to 151,500 horse-power, but in addition to their water-wheels and turbines the hydraulic organizations maintain fuel auxiliary or stand-by equipment aggregating 133,562 horse-power, or an amount equal to 88.2 per cent of the main fuel station equipment, for use during periods of excessive demand or shortage of power due to accidents, insufficient water or similar causes.

The total capacity investment of the industry amounts to \$484,669,451, of which \$455,193,498, or over 94 per cent, represents the value of the hydraulic stations and their transmission and distribution equipment as compared with \$29,376,580, the investment of the fuel organizations.

A comparison of the revenue and output of the two classes of stations brings to light the most significant figures of the analysis from the standpoint of the power consumer. The hydraulic generating stations produced 5,447,582,000 kilowatt hours of energy and the revenue received by all hydraulic stations amounted to \$63,622,279, or an average of 1.1678 cents per kilowatt hour. The fuel generating stations produced 166,550,000 kilowatt hours for which the revenue received was \$9,754,301, or 5.8567 cents per kilowatt hour. While these figures are somewhat affected by sales of power from one generating station to another and by the practice of the larger hydro-electric organizations in selling a large part of their output *en bloc* to non-generating organizations for distribution, the disparity in price remains very marked.

An outstanding feature of this census is the large number of existing hydro-electric stations which report contemplating the installation of additional equipment, a total of 92,540 horse-power being so reported. In addition a considerable number of new stations are under construction.

DOMINION HYDROMETRIC SURVEY

The Dominion Hydrometric Survey has during the past year become national in scope, embracing all the provinces in the Dominion. Other than the Prairie Provinces, where the work is a direct responsibility of the Federal Government, co-operative agreements for such work have been entered into from time to time with individual provinces, until with the consummation on October 1 of such an agreement with the Quebec Streams Commission, all the provinces were comprehended in the surveys activities. This consolidation of hydrometric investigation has rendered most effective both the gathering and dissemination of stream flow data. Methods throughout have been standardized with a consequent natural gain in efficiency and an over-all saving in administration, together with the added valuable factor of making available to the public water resources information at one central source.

The ever-increasing utilization of water resources for diversified and often conflicting purposes has given rise to a most pressing demand for detailed and extensive records of the regimen of the various lakes and rivers of the country and particularly has this been evident in connection with power development and irrigation projects. Probably in no greater manner is recognition given the importance of stream flow records than in the material voluntary co-operation afforded the survey by numerous individuals and private corporations.

With consolidation of the hydrometric survey, it has been possible to so rearrange both field activities and office administration as to ensure the most

efficient prosecution of the work. For purposes of field operation and publication of records the past arbitrary divisions of provincial boundaries have been eliminated, and the logical and natural divisions of major drainage basins instituted. The main drainage basins into which the country has been divided together with the location of the district office or offices in charge are as follows: Pacific Drainage, Vancouver; Arctic and Western Hudson Bay Drainage, Calgary and Winnipeg; St. Lawrence and Southern Hudson Bay Drainage, Ottawa and Montreal; Atlantic Drainage, Halifax.

Run-off Conditions in Canada.—With the exception of southeastern Saskatchewan, southern Manitoba, and the Maritime Provinces, the average run-off for the year as shown in detail in the reports of the district chief engineers was slightly below normal. The distribution of run-off throughout the year was, however, at variance with average conditions; in the major portion of the country flood inflow exceeded the average while run-off during the autumn months was deficient.

In the Pacific Drainage, stations typical of general run-off conditions indicated a run-off of 95 per cent of the average. Flood run-offs while not abnormal exceeded the mean by from 5 per cent to 50 per cent, whereas deficiencies in other months ranged from 20 per cent to 30 per cent below the mean.

Run-off in the Arctic and Western Hudson Bay Drainage with the exception of the Assiniboine River basin, ranged from 50 per cent to 90 per cent of normal. In the Assiniboine basin and adjacent smaller basins to the north excessive spring floods were encountered and the average for the year was 200 per cent of the mean of previous years.

In the St. Lawrence and Southern Hudson Bay Drainage comparative records are only available for drainage within the province of Ontario, where the average for the year ranged from 70 per cent to 97 per cent of the mean.

Run-off in the Atlantic Drainage as comprising the Maritime Provinces was exceptional as compared with the other drainages. Flows 200 per cent of the normal during summer months raised the average for the year above that of other years.

POWER AND STORAGE INVESTIGATIONS

Owing to the need for careful apportionment of field expenditures, power and storage investigations were undertaken during the past year only where urgent conditions demanded. In head office, however, and in the various field offices the analysis was continued of the developed and undeveloped water-power resources of the Dominion. This work was carried on in co-operation with the provincial authorities in British Columbia, Ontario, Quebec and the Maritime Provinces, where administration of water-powers is purely a provincial responsibility.

In British Columbia a special study was commenced of the run-off data of certain streams in connection with proposed power schemes supplying the city of Vancouver. The analysis of the water-power resources of the province was actively carried forward in co-operation with the Provincial Water Rights Branch.

In Alberta attention was given to an application to develop power on the Crowsnest river and an interim license was recommended. An inspection was made of a small water-power site on Cranberry creek, and an investigation also made of the condition of a dam at the outlet of Gull lake formerly used for power. Responsibility for the operation of the lake Minnewanka storage during the filling seasons was again assumed by the department with very satisfactory results to all concerned. In connection with the power possibilities of the Bow River basin, office studies were made of dependable outflow from Spray lakes and lake Minnewanka.

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In Manitoba an investigation was made in connection with an application to develop a small water-power on Peterson creek, a tributary of the Bird river. In co-operation with the Geodetic Survey of Canada a series of permanent bench-marks were established at all strategic points along the Winnipeg and English rivers.

In Ontario surveys were made at the outlets of the Lake of the Woods at the request of the Lake of the Woods Control Board for the purpose of ascertaining the best methods of obtaining a better control and regulation of the lake. In connection with the analysis of the water-power resources of the province, office studies were continued in co-operation with the provincial authorities.

In Quebec, following the co-operative agreement between this branch and the provincial authorities, an exchange of water resources data was made and the analysis of the developed and undeveloped powers of the province was actively carried forward.

In New Brunswick active co-operation was maintained with the New Brunswick Electric Power Commission, and investigations were carried out on the Digdequash and two other small streams near St. George; also an investigation was commenced at Grand falls, on the St. John river.

In Nova Scotia co-operation was maintained with the Nova Scotia Power Commission and investigations were made on the Economy river, Fales river near Kingston, Mulgrave brook and Pirates Cove brook near Mulgrave, river John near the village of River John, and Tupper Lake brook near Waterville. Office studies were made of a number of projects actively under consideration.

FLOODED LAND SURVEYS

The work of fixing a boundary for the area to be reserved for power purposes along the Winnipeg river, which was commenced in 1919 and continued in 1920 and 1921, was this year extended so as to include that section of the river between the McArthur Falls site and the power development now under construction at Great Falls. In addition to the survey of the Great Falls section a survey was made of that portion of the river extending from the lower Seven Sisters site in section 5, township 14, range 11, E.P.M., to the east boundary of sections 27 and 34 in township 13, range 11, E.P.M.

The survey of the power reserve in the Great Falls section was commenced at the north boundary of sections 34 and 35 in township 16, range 11, and extended northward E.P.M. to near the north boundary of section 27, township 17, range 11, E.P.M. The retracement survey was closed on the northeast corner of section 34, township 17, range 11, E.P.M. The location of the boundary of the power reserve involved the survey of contour 814 feet. For this purpose elevations were taken throughout the district and a traverse was run near the contour. The courses were measured by means of a transit and chain. The boundaries of the sections intersected by the traverse were surveyed and the traverse was closed on the section lines.

In the traverse of the west side of the Great Falls section there is a break in the contour at T.H. 18 to T.H. 21, at T.H. 28 to T.H. 29 and at T.H. 38 to T.H. 44. The summit here is below elevation 814 feet and if the water surface is raised to elevation 805 feet or over, dyking will be necessary. The average fill necessary to raise the ground surface to elevation 814 feet will be 6.5 feet and the length of the embankment will be 10,550 feet along the railway in addition to the two smaller fills aggregating 1,000 feet in length and 3 feet in height. If the railway grade were used as a dyke the same results would be obtained by raising the grade an average of 3 feet for a distance of 9,000 feet in addition to the two smaller dykes mentioned above.

In the Great Falls survey 40 miles of traverse and 25 miles of section lines were run.

The work at the lower Seven Sisters site was commenced on the north boundary of section 5, township 14, range 11, E.P.M., and closed on the east boundary of sections 27 and 34 in township 13, range 11, E.P.M. Contour 875 feet was traversed on both sides of the Winnipeg river and the boundaries of the sections crossed by the traverse were resurveyed in the usual manner. No attempt was made, however, to locate this contour along the Whitemouth river which enters the Winnipeg river from the south in section 28-13-11 E.P.M.

The banks of the Winnipeg river just below the lower falls are very high and being of clay are, in some places, very unstable. Immediately below the junction of the Whitemouth with the Winnipeg the south bank is about 50 feet above the water.

In the lower Seven Sisters district 15 miles of traverse and 15 miles of section lines were surveyed. The posting of this section was not completed owing to low water in the river which prevented the transport of supplies and necessitated closing down the work earlier than was expected.

PART VI

NORTHWEST TERRITORIES AND YUKON BRANCH

REPORT OF THE DIRECTOR, O. S. FINNIE

GENERAL

All matters, with the exception of mining, pertaining to the Department of the Interior and having to do with the Northwest Territories and Yukon, are now under the control of this branch. During the year there has been steady progress in the work carried out in both administrative divisions, and statements respecting the different features will be found hereunder.

Northwest Territories.—A change has been effected in the title of the chief executive officer at Fort Smith. The position of Mining Recorder, Mackenzie District, N.W.T., is abolished and a new position, District Agent, admitting of a wider scope, has been created.

Mr. Justice Dubuc, Judge of the District Courts (Peace River and Edmonton) by virtue of Order in Council, dated June 28, 1922, was appointed Stipendiary Magistrate for the Northwest Territories.

Customs duties in the Franklin district are now collected at Craig Harbour and, as formerly, at Ponds Inlet, by members of the Royal Canadian Mounted Police.

Post offices were established at Aklavik, Mackenzie district, on July 6, 1922, and at Craig Harbour, Ellesmere island, Franklin district, on August 28, 1922.

On the close of navigation in 1922, the Union Bank of Canada transferred its branch office from Fort Smith to McMurray, Alberta.

During the year, Mr. J. F. Moran made a trip of general inspection in the Mackenzie district, proceeding down river as far as Aklavik. Mr. W. L. L. Cassels was engaged on survey and other related work in the vicinity of Fort Smith, while Mr. Maxwell Graham investigated matters pertaining to the wood bison and the area then under consideration for the habitat of these animals.

Yukon Territory.—The director made a trip to the Yukon in the summer of 1922 on special investigational work, not only for the Department of the Interior, but also for the Departments of Justice, Public Works, and Post Office.

The report of the Gold Commissioner at Dawson, which will be found hereunder, deals with all the phases of the work except mining conditions. His report on mining will be found in the report of the Mining Lands Branch in the Dominion Lands section of this report.

NORTHWEST TERRITORIES

EDUCATION AND HEALTH

The sum of \$3,000 was set apart for education for the fiscal year in the Northwest Territories. One thousand dollars was devoted to general purposes and the remainder applied toward the support of boarding and day schools, conducted by the Church of England and Roman Catholic missions.

Day schools, maintained by the Church of England missions at Aklavik, McPherson, and Simpson, received \$200 each, and the boarding school at Hay River, \$400. The day school maintained by the Roman Catholic mission at Fort Smith received \$200, and boarding schools at Providence and Resolution \$400 each.

A total of \$6,925 was expended on the Fort Smith and Simpson hospitals during the year. A grant of \$1.50 per day was made for the maintenance of indigent whites and half-breeds in the hospitals in the various districts, and an extra 50 cents per day for each patient treated.

The number of days devoted to the treatment and maintenance of each class of patients was as follows: Treaty Indians 7,375, indigent whites and half-breeds 1,398, pay patients 573, total 9,346.

During the year the fullest co-operation was extended to the Dominion Bureau of Statistics. Under authority of the Vital Statistics Ordinance, a supply of forms was distributed throughout the territories to qualified persons to aid in the collection of more important figures. The Dominion Bureau is giving further consideration to the organization of the territories for the purpose of facilitating collection of statistics.

The annual return up to December 31, 1922, which was laid before Parliament in accordance with section 88, chapter 62, R.S.C., on February 18, 1923, shows the number of permits issued by the commissioner to import liquor into the territories, for medicinal purposes, to have been 140, and the amount to have been 358 gallons. The maximum quantity permitted each person for medicinal purposes is two gallons per annum.

TIMBER

The regulations relating to the conservation of timber were strictly enforced. An official of the Northwest Territories acted as chief fire ranger, and had jurisdiction between Wrigley and Good Hope.

The portable saw-mill taken over from the Department of Indian Affairs was set up at Grande De Tour on Slave river, forty miles north of Fort Smith. The mill was operated during the summer of 1922, turning out approximately 500,000 feet of lumber. Shipments were made to various trading posts and the remainder held for future requirements.

GAME

Under the North West Territories Game Act, which is enforced by the Royal Canadian Mounted Police, licenses were issued as follows:—

Hunting and Trapping.—Residents, 151; non-resident British, 65; non-resident non-British, 26; total, 242.

Trading and Trafficking.—Residents, 155; non-resident British, 6; non-resident non-British, 8; total 169.

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The revenue received from these licenses amounted to \$5,613.

Furs taken under license and as given in returns received during the year were as follows:—

STATEMENT OF GAME TAKEN IN THE NORTHWEST TERRITORIES IN THE FISCAL YEAR 1922-23

Animal	Hunting and Trapping	Trading and Trafficking	Totals	Approximate value of pelts	
				Average value pelts	Total value of pelts
	No.	No.	No.	\$ cts.	\$ cts.
Moose.....	31	16	47	2 85	133 95
Caribou.....	147	88	235	2 00	470 00
Deer.....	11	300	311	1 38	429 18
Mountain sheep.....	8	.....	8	.....	.....
Mountain goat.....	96	.....	96	.....	.....
Otter.....	2	64	66	27 26	1,799 16
Beaver.....	124	2,292	2,416	18 38	41,406 08
Marten.....	1,629	7,429	9,058	20 61	186,685 38
Fisher.....	1	9	10	74 65	746 50
Mink.....	905	6,952	7,857	9 00	70,713 00
Muskrat.....	14,284	153,894	168,178	1 53	257,312 34
White fox.....	2,112	23,935	26,047	38 26	996,558 22
Blue fox.....	6	62	68	70 87	4,819 16
Red fox.....	5	369	374	12 46	4,660 04
Cross fox.....	176	1,229	1,405	50 36	70,755 80
Black fox.....	.....	12	12	6 12	73 44
Wolf.....	71	271	342	10 35	3,539 70
Wolverine.....	27	219	246	17 56	4,319 76
Lynx.....	50	185	235	20 37	4,786 95
Skunk.....	27	18	45	2 34	105 30
Ermine.....	1,077	4,332	5,409	0 55	2,974 95
Brown bear.....	29	294	323	9 26	2,990 98
White bear.....	1	39	40	18 08	723 20
Coyote.....	.....	3	3	9 07	27 21
Silver fox.....	.....	4	4	147 36	589 44
					1,659,619 74

WOOD BUFFALO PARK

A reserve of approximately 10,500 square miles, created by Order in Council as a Wood Buffalo park under the authority of the Forest Reserves and Parks Act, was made to include the entire habitat of the wild bison of the north, and a portion of the habitat of the woodland caribou. The area extends north and south of the northern boundary of the province of Alberta, and consists of a northern and a southern range, sheltering approximately 1,500 buffalo. The park is in the care of a warden service consisting of nine men, and the district agent at Fort Smith occupies the position of park superintendent.

INSPECTION TRIP TO THE NORTHERN ARCHIPELAGO

Departmental officers made a trip to the northern islands via Davis strait and Baffin bay in the Canadian Government steamship *Arctic*, during the summer, with the object of making a general inspection of the district, enforcing existing regulations and preserving law and order. The party sailed from Quebec July 18, 1922, returning to that port October 2, having established police posts at Craig Harbour on Ellesmere island, and Ponds Inlet on the north coast of Baffin island. The expedition was in charge of Mr. J. D. Craig, D.L.S., and the ship was commanded by Captain J. E. Bernier.

An inspector and six other members of the Royal Canadian Mounted Police were left at Craig Harbour while a corporal and two men were detailed to assist Sergeant Joy at Ponds Inlet, where he had been for the year previous investigating an alleged murder. Supplies for two years were left at both posts. Astronomical stations were also established marked by brass bolts inscribed "Canada, N.W.T.," and observations were taken to determine latitude, longitude, and azimuth.

Data were secured for the mapping of Craig Harbour, Dundas Harbour, Albert Harbour, and Ponds Inlet, and a hitherto uncharted portion of the coast of Ellesmere island was explored and sketched.

Valuable information concerning flying conditions in the north was obtained by a representative of the Air Board who accompanied the expedition, and a complete cinematographic record of the trip was taken.

REINDEER HERD AT LOBSTER BAY

Mr. D. L. McKeand of this branch, and Dr. Seymour Hadwen, veterinarian and parasitologist, made inspections of the reindeer herd at Lobster bay, Quebec. The herd was originally imported from Norway into Newfoundland by the Grenfell Institute and was later transferred to Lobster bay at which time it numbered 125 head.

The reindeer were reported as healthy and a slight numerical increase estimated. Owing to the cost of maintenance, and the unsatisfactory results of the whole experiment, it was decided to accept an offer made by Mr. G. Martin-Zede, manager of the Island Administration of Anticosti, to assume responsibility in 1923 for the care and maintenance of the herd. According to the agreement, the reindeer are to remain the property of the department until by natural increase, five times the number of reindeer transferred to the island are returned; in addition, all facilities are to be afforded by the custodians to any official authorized by the minister to make an inspection, and suggestions as to betterment of the herd are to be carried out.

Owing to depredations by wolves in the time previous to the herd's shipment to Anticosti, their temporary removal from Lobster bay to the Dog islands was authorized.

PUBLICATIONS

During the fiscal year the following publications were issued and are now available for distribution:—

- 1 Manual for operators under Oil and Gas Regulations.
- 2 Reindeer and Musk-ox Report.
- 3 Posters and Circulars for the Protection of Caribou.
- 4 Game Law Posters.

The purpose of the "Oil and Gas Manual" is to furnish the operators and drillers with a concise and convenient arrangement of the Petroleum and Natural Gas Regulations which directly or indirectly concern the operations conducted on petroleum and natural gas leases. Explanations and instructions are given indicating the particulars required by the Department of the Interior and the correct method of filling out the forms in compliance with the regulations. The manual is accompanied by a map, showing the natural gas resources of the province of Alberta. This map may be obtained without the report if so desired. Operators will find it advantageous to keep the manual at hand for reference, and to furnish drillers with copies thereof.

The "Reindeer and Musk-ox Report" is the result of an exhaustive research on the part of the Royal Commission appointed by Order in Council, on May 20,

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1919, to investigate the possibilities of the reindeer and musk-ox industry in the Arctic and Sub-Arctic regions. The personnel of this commission was as follows: Dr. J. G. Rutherford, C.M.G., chairman, and Messrs. J. B. Harkin and J. S. McLean, commissioners.

Folders and posters for the protection of caribou were printed in both English and Cree and distributed throughout the Northwest Territories.

Game law posters, indicating the open and close season for hunting and trapping in the Northwest Territories, were also distributed.

REVENUE

A statement of revenue collected for the fiscal year 1922-23 is attached, and the reports of the senior mining inspector and the petroleum engineer are submitted herewith.

NORTHWEST TERRITORIES REVENUE

STATEMENT—Revenue collected in the Northwest Territories in the fiscal year 1922-23

	\$ cts.	\$ cts.
Dominion Lands—		
General sales.....	784 39	
Sundry fees.....	12 00	
Suspense account.....	1,689 05	
		2,485 44
Crown Timber—		
Timber dues.....	1,876 54	
Hay permits.....	6 00	
		1,882 54
Mining—		
Petroleum.....	10,987 31	
Registration fees.....	28 00	
Mining fees.....	5,571 81	
		16,587 12
General—		
Liquor permit fees.....	231 40	
Fines and forfeitures.....	527 40	
Trappers' licenses.....	4,433 00	
Traders' licenses.....	1,180 00	
		6,371 80
Grand total.....		27,326 90

MINING—C. C. ROSS, SENIOR MINING INSPECTOR

The failure of the Western Canada Operators and the United Mine Workers of America to agree as to the terms of a new contract to replace the one which expired March 31, 1922, resulted in a strike in all the union mines in Alberta, lasting four and a half months. The parties eventually came to terms to resume work under the terms of the old agreement until March 31, 1923, and this was extended in February, 1923, to March 31, 1924. This strike and the general economic depression, coupled with the mild weather which prevailed during the fall and winter, were some of the causes of considerable fluctuation in the output of coal in Alberta during the last year.

The Fordney Tariff Bill, placing a duty of fifty-three cents a ton on sized coal and fourteen cents a ton on slack, imported into the United States, seriously affected the export of coal from the Crowsnest Pass field into the adjacent north-western states.

The table which follows is divided into three classes showing output of coal from Dominion lands subject to royalty, coal subject to royalty taken from School lands, and coal produced not subject to royalty.

Province	Calendar year	Output subject to Royalty		Not subject to Royalty	Total
		Dominion lands	School lands		
		tons	tons	tons	tons
Alberta.....	1921	3,282,838	312,962	2,331,470	5,927,270
Saskatchewan....	1921	46,142	48,480	247,190	341,812
Alberta.....	1922	3,485,920	200,306	2,290,206	5,976,432
Saskatchewan....	1922	48,760	48,491	285,186	382,437

The table hereunder shows the number of mines operating in Alberta and Saskatchewan during the years 1921 and 1922, subject to royalty, and those not subject to royalty, also the total number operated in each province.

Province	Calendar year	Number of operating coal mines subject to royalty		Not subject to royalty	Total
		Dominion lands	School lands		
		No.	No.	No.	No.
Alberta.....	1921	179	16	76	271
Saskatchewan....	1921	57	6	15	78
Alberta.....	1922	236	24	119	379
Saskatchewan....	1922	50	10	20	80

In Alberta, operating mines were inspected and reported on. Mr. F. M. Steel was appointed mining inspector, and reported for duty on August 28, 1922, to succeed Mr. J. W. McIntosh, who resigned on April 1, 1922. For two months in the intervening period Mr. R. J. Lee, the inspector for Saskatchewan, was stationed in Calgary to assist Mr. Ross with Alberta inspections.

During the year, development work was started in the western limit of the Crowsnest field by the Spokane Alberta Coal Company, Ltd. It is expected that a spur five and a half miles long will connect this new mine with the Crowsnest Branch of the Canadian Pacific Railway. The principal producing fields in Alberta are as follows:—

Steam coal—(1) Crowsnest-Bellevue, Coleman area; (2) Rocky Mountain Park-Canmore, Bankhead area; (3) Brazeau-Mountain Park, Coalspur-Brûlé area.

Domestic—(1) Lethbridge; (2) Drumheller; (3) Carbon; (4) Ardley; (5) Saunders; (6) Edmonton; (7) Wabamun.

Since the completion of the Acme-Drumheller branch of the Canadian Pacific Railway there has been a great increase of activity in the carbon field, a new domestic coal area of considerable extent. This branch line also affords additional transportation facilities for the mines in Red Deer valley, and if the proposed extension of the railway southeasterly along the Red Deer river is carried out it will increase the chances of that large area south of Drumheller, now held under the coal-mining regulations, of becoming a productive field. Existing mines have largely improved their equipment. The Peerless Coal Company has installed a new plant and the Carbon Fuel Power and Light Company has installed electric coal-cutting machines.

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Unfortunately the larger mines in the Taber district have been experiencing financial and labour difficulties, with the result, in one case, of the Canada West Coal Company being taken over by the trustees and only being operated at present on a comparatively small scale. The Regal collieries have been closed down since December for like reasons.

In the Ardley district the Carbondale Coal Company has installed an up-to-date plant and extended its operations. Many country bank mines of limited extent have been opened up chiefly in the domestic coal areas, and although their output is approximately only 8 per cent of the total lignite production, they have been the means of enabling the farmers, as well as the people of the small towns and villages, within a limited radius, to obtain suitable fuel at a low rate.

In Saskatchewan eleven new mines were surveyed and thirty-three extensions made. The inspector assigned to Saskatchewan was called upon several times to advise the managers of mines in emergency cases. One such instance occurred on April 27, when it was estimated that 10,000,000 gallons of water broke into the Crescent collieries.

Several cases of illegal mining were investigated and reported on. A number of small operators were also advised as to the best and most economical methods of working their mines.

There were no strikes during the year in this province and no fatal accidents in any of the mines being operated on Dominion lands. This satisfactory state of affairs is due largely to the fact that since the appointment of an inspector for Saskatchewan the small operators are using more timber and working their mines in a more systematic manner than formerly.

PETROLEUM AND NATURAL GAS—S. E. SLIPPER, PETROLEUM ENGINEER

Routine inspections were made during the year. A large part of the time was taken up in complying with requests of operators and others for advice and assistance.

Early in the year it was reported that one of the capped gas wells at Upper Pelican on the Athabaska river had "blown out" around the valve and that the flow of gas had become ignited and was burning fiercely. This type of gas well fire is very difficult to extinguish and in order to successfully accomplish the feat some unique and original methods were introduced. Briefly it may be explained, that the defective valve was removed from the well by using rifle fire from a distance of 25 yards to cut the casing immediately below the valve, which then dropped off the casing head. Afterwards the flame was extinguished by diverting the flow of gas with a smokestack brought over the mouth of the well by means of a travelling pulley on an aerial cable.

Practical experiments in the field have proved the usefulness of the Wheatstone Bridge to detect the source of waters found in defective wells. This very useful method of quick analysis was developed through the assistance of the Mines Branch of the Department of Mines.

Apparatus was constructed for determining the quantity of gasolene in natural gas and tests of gas were made in the Turner Valley field.

DETAILS OF OPERATIONS APRIL 1922-MARCH, 1923

Province	Number drilling during year	Com- menced this year	Aban- doned this year	Producing gas	Producing oil	Remarks
Alberta.....	25	9	3	*59	6	*Does not in- clude gas wells capped
Saskatchewan.....			2			
Manitoba.....	1					Railway belt
British Columbia.....	1					
Northwest Territories..	4				1	

Northern Alberta

Peace River Field.—Active boring operations were carried on at one location during the year. At the bore hole in question the drill has penetrated through the Cretaceous to a considerable depth into the underlying Devonian. It is reported that strong seepages of oil have been obtained in the Devonian and if this is correct it would lend a much more promising outlook for the development of an oil production in the area lying between the Peace and Athabaska rivers.

There are eight bore holes in the Peace River field where the water horizons have not been sealed off, and from which large volumes of natural gas are being continuously dissipated.

Pouce Coupé Field.—The Northwest Company have continued drilling on section 26, township 80, range 13, west of the Sixth meridian. Very little progress was made during the past year.

Central Alberta

Birch Lake District.—Drilling has been in progress on section 14, township 50, range 12, west of the Fourth meridian. Some very promising showings of light oil were obtained at 2,040 feet. Drilling was suspended during the winter months.

Fabyan-Wainwright District.—The Northwest Company abandoned their Gratton No. 1 on L.S. 16, section 18, township 45, range 7, west of the Fourth meridian, after having attained a depth of 2,730 feet. Heavy black oil was obtained at different horizons between 1,892 feet and 2,225 feet in both lower Cretaceous and Paleozoic. The oil was of such poor quality and so viscous that it was not possible to produce.

Natural gas was obtained at depths between 1,727 and 1,870. The probable open flow of the well was 10,000,000 cubic feet per day, and the pressure about 750 pounds. The well was abandoned in such manner that it can in the future be utilized as a gas well.

The British Petroleums Company are drilling for oil on L.S. 1, section 36, township 45, range 7, west of the Fourth meridian. At 2,015 feet a large flow of gas was obtained. Drilling is being continued deeper.

Monitor District.—The West Regent Oil and Gas Company drilled to a depth of 2,000 feet, with rotary equipment on section 19, township 34, range 4, west of the Fourth meridian, and then changed over to cable tools and drilled to 3,350 feet, when operations were suspended. The Paleozoic limestones were penetrated at 3,000 feet and were found to be slightly bituminous.

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Misty Hills District.—The Northwest Company have been drilling on section 29, township 32, range 4, west of the Fourth meridian. The well was abandoned during the year at a depth of 3,300 feet without having penetrated the Paleozoic limestone.

Foot-hills

Coalspur District.—The Northwest Company have been drilling on section 3, township 49, range 21, west of the Fifth meridian.

Turner Valley Field.—Natural gasoline is obtained from the gas produced from wells Nos. 1, 2, and 3 of the Royalite Company. The gas, after the extraction of gasoline, is transmitted to Calgary for domestic consumption. The Turner valley production is the mainstay of Calgary's supply. The Bow Island field, which formerly supplied Calgary's fuel consumption, is now practically exhausted. The daily production from the Turner Valley field approximates 4,000,000 cubic feet.

A production of oil is obtained from southern Alberta wells Nos. 1 and 2, the Alberta Southern well No. 1, the Canada Southern well No. 1, and the Sheep River Oil Company's well No. 1. No. 4 well of the Royalite Oil Company, which was commenced this year, has recently obtained a flow of gas at a depth of 1,700 feet.

In September, 1922, an inspection was made of the Illinois Alberta well on L.S. 14, section 12, township 30, range 3, west of the Fifth meridian. The well was 3,040 feet deep and a large volume of gas was flowing from it. The flow was measured and proved to amount to 1,096,000 cubic feet per twenty-four hours. In January, 1923, advice was received from the company that the flow had suddenly increased without, however, any further drilling having been done. The new flow was measured and determined to be 3,312,576 cubic feet per twenty-four hours open flow, and the closed pressure of the gas was 820 pounds. Under the conditions this increase is a remarkable occurrence. The flow was again measured in February and this time the measurement showed only 1,261,920 cubic feet, but it is believed that between the January test and that of February the well casing had become defective. Tests were also made of the gasoline content of the gas and it was found to contain an appreciable amount.

Willow Creek District.—The Northwest Company are drilling the Willow Creek well on section 29, township 14, range 2, west of the Fifth meridian. A small amount of oil and gas has been obtained, but not in commercial quantities. Drilling is being continued.

Southern Alberta Prairie

Bow Island Gas Field.—The maximum pressure of natural gas now obtained in this field amounts to a little over 180 pounds gauge pressure, and the supply from this field is used by the Canadian Western Natural Gas, Light, Heat and Power Company to serve as a reserve in cold weather to augment the supply now obtained from the Turner valley for the city of Calgary and other points in southern Alberta.

Medicine Hat-Redcliff Field.—No new development took place during the year. Pressure tests in the Medicine Hat field indicate a decline of 10 or 15 pounds for the year.

Many Island Lake Field.—Natural gas is flowing from the well drilled by the Medicine Hat Development Company on L.S. 4, section 19, township

14, range 1, west of the Fourth meridian. This flow is not under control, as the casing is in such a defective condition that the well cannot be capped. The company have notified the department that they will take steps to put the well in proper condition.

The Community Oil Wells, Limited, have been drilling a well on L.S. 7, section 19, township 14, range 1, west of the Fourth meridian. A depth of 2,315 feet has been attained. At this depth the well was working in Colorado formation. The hole has been drilled with a rotary equipment, but it is intended to replace this type of machinery with cable tools in order to continue the hole to a depth of some 3,000 feet.

Coutts Sweetgrass District.—The successful development of the Montana Sweetgrass oil field about twelve miles south of the Alberta boundary stimulated prospecting on the Canadian side of the border. Seven bore holes were commenced in township 1, with the greatest concentration in range 15, which is immediately north of the Montana oil field. Only one of these wells has penetrated the horizon in which the oil is found in the Montana field. At this one location a very good showing of a good grade of oil was found, but as water came into the hole the actual amount of oil was not determined.

Pakowki Lake District.—The Sanctuary Oil Company are drilling on an island in Pakowki lake in L.S. 10 of section 10, township 5, range 8, west of the Fourth meridian. The well is now down into the Colorado formation.

Saskatchewan

The Consul well of the Northwest Company which is located on section 9, township 1, range 27, west of the Third meridian, was abandoned during the year, as was also their Unity well on section 7, township 39, range 22, west of the Third meridian. No new drilling was undertaken in Saskatchewan during the year.

British Columbia

Only one company reported active drilling operations on the Fraser delta in the vicinity of Vancouver. The activity in this area seems to have declined considerably.

Northwest Territories

Recent information from the north would seem to indicate that the Discovery well drilled by the Imperial Oil Company, in the vicinity of Fort Norman, has been greatly improved by deeper drilling. The Sub-Mining Recorder reports that the well is capable of producing at the rate of 100 barrels per day, and that there is a gauge pressure of 250 pounds on the well. The depth of the hole is 991 feet. Drilling at the other camps of the Imperial Oil Company has been very slow and backward due to the great difficulties encountered in carrying out drilling operations in the far north.

The White Beaver Oil Company carried out drilling operations on Hay river, in the Great Slave Lake district, and after reaching a depth of 712 feet, where a heavy flow of salt water was struck, the well was abandoned. No oil or gas was found at this location.

Mudding and Cementing Operations

There was no work done during the year with the mudding and cementing equipment. The pumps and other equipment have been held at Peace River in anticipation of work continuing on the defective wells in that field.

YUKON TERRITORY

GEO. P. MACKENZIE, DAWSON, YUKON TERRITORY—GOLD COMMISSIONER

Agriculture.—The farmers had a fairly successful year. The potato crop, however, was not up to the average. Stock raising is receiving more attention, and the local supply of beef thus made available is bringing a higher price on the market than that brought in from outside. A number of farmers are trying sheep-raising and appear to be satisfied with the result. Each year sees an increase of the quantity of fodder grown, brome grass being the most satisfactory hay.

Wood and Timber.—One hundred and twenty-five permits to cut wood and timber were issued during the year. The quantity of saw-timber cut under permits during the year on which dues were paid was 490,410 feet board measure. The quantity of cordwood cut under authority of permits during the year was 16,631 cords. Cordwood cut without authority of permit on which seizure dues were paid amounted to 66 cords. Seizure dues were also paid on 54,850 linear feet of building logs, and 53,750 feet board measure of timber. The quantity of cordwood cut on timber berths on which dues were paid was 3,585 cords.

Yukon Council.—The annual session of the council was held in May. Certain minor amendments were made to the existing ordinances but no new legislation of importance was enacted. As by law, it was necessary to elect a new council, the election was held on August 11, 1922, the following members being returned: for Dawson, William Kenneth Currie; for Whitehorse, Robert Lowe; for Klondike, John Emmett Farrell.

Hospitals and Public Health.—The health of the people generally has been good, no epidemics having occurred. St. Mary's Hospital continues to meet all requirements in the portion of the territory adjacent to Dawson, and the General Hospital at Whitehorse those of the southern end of the territory. The demand, however, for hospital accommodation at Mayo was so insistent that a hospital was built at that point and was ready to receive patients on October 1. The cost of erecting this hospital was a very serious drain on the slender resources of the territory, but from reports received splendid service has been given during the past winter.

Education.—The usual public and high schools were maintained at Dawson and Whitehorse, also a public school at Mayo. In all probability it will be necessary to open additional schools next year at other centres throughout the territory.

Through the efforts of the Bishop of Yukon, Dr. Stringer, a hostel was opened at Dawson for the half-breed children throughout the territory. This hostel is maintained by private funds and the children attend the public school at Dawson.

Game.—Reports received from officers of the Royal Canadian Mounted Police, who are game guardians, and others qualified to know, show that game generally throughout the territory is plentiful. Reports indicate, however, that wolves are very numerous in many places, and are destroying much game. A number of big game hunters were in the territory during the past year and generally expressed themselves as being satisfied with the results of their hunts.

Law and Order.—Order has been well maintained throughout the territory during the year. The Royal Canadian Mounted Police have made frequent patrols to outlying creeks.

